SELECTED

SESOURCESABSTRACTS



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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 7, NUMBER 23 DECEMBER 1, 1974

W74-12001 -- W74-12750

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Research and Technology U.S. Department of the Interior Washington, D. C. 20240

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT,

Delaware Univ., Newark. Coll. of Marine

Sciences. W. S. Gaither, and V. Klemas.

Available from the National Technical Informa-Troin the reaumal Technical Informa-tion Service, Springfield, Va 22161 as AD-772 104. Technical Report No 25, November 1973. 36 p, 7 fig, 2 ref. N00014-69-A0407.

Descriptors: *Coasts, *Oceans, *Environment, *Remote sensing, Waves(Water), Soil properties, Turbidity, Geology, Currents(Water), Sediment transport, Mathematical models, Shores, Comuausport, Matnematical models, Shores, Computer programs, Forecasting, Physical properties Hydrography, Delaware, Meteorological data, Estuaries, North Carolina, Georgia, Florida, Tidal marshes, Methane.

Identifiers: *Seacoasts, Delaware Bay(Delaware), Coastal zone.

Research emphasizing coastal geologic processes, wave and sediment analysis, and remote sensing investigations is summarized. A process-response model based on Krumbein's concept was conceived and formulated for beach processes. A conceptual classification of sandy coastal plain shorelines was completed. Mechanics of sediment motion and transport in the wave field were systematically analyzed, and the results applied to the random wave field. Probabilistic and statistical concepts and methods are being developed for practical and reliable predictions of primary physical, meteorological and geological parameters. A thermodynamic model of sea state has been developed on the analogy drawn between the problem of black body radiation in thermal physics and the problem of spectral distribution of wave energy in air-sea interactions. Optical Fourier techniques were employed to determine changing directional spectrum of waves. Fronts, a major hydrographic feature in Delaware Bay and other estuaries, have been investigated. An inexpensive. rapid approach for continuously monitoring optical water properties along a coastal transect has been developed. Marsh gas of southeastern tidal mangrove marshes, Spartina, freshwater acidic and sawgrass swamps was compared to that from inland marshes separated from tidal action and indicated a Eh relationship. (Jones-Wisconsin)

1B. Aqueous Solutions and Suspensions

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT, Delaware Univ., Newark. Coll. of Marine

Sciences. For primary bibliographic entry see Field 1A. W74-12554

2. WATER CYCLE

2A. General

HYDROLOGIC CONSEQUENCES OF USING GROUNDWATER TO MAINTAIN LAKE LEVELS AFFECTED BY WATER WELLS NEAR TAMPA, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 4B.

SELECTED BIBLIOGRAPHY ON WATER BALANCE OF MONSOON ASIA (III), Meteorological Research Inst., Tokyo (Japan). For primary bibliographic entry see Field 2B. W74-12019

DEVELOPMENT OF A UNIFIED TRANSPORT MODEL FOR TOXIC MATERIALS, Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 5B. W74-12022

INTERNATIONAL WORKSHOP ON THE HYDROLOGICAL EFFECTS OF URBANIZA-TION, WARSAW, 1973.

American Society of Civil Engineers, New York. For primary bibliographic entry see Field 4C. W74-12052

A FEASIBILITY STUDY OF USING REMOTE-LY SENSED DATA FOR WATER RESOURCE MODELS.

Colorado State Univ., Fort Collins. J. F. Ruff.

Available from NTIS, Springfield, Va 22161 as N73-23479, Price \$3.75 printed copy; \$2.25 microfiche. National Aeronautics and Space Administration Contractor Report CR-129001, February 1973. 29 p, 15 fig, 2 tab, 4 ref. NAS 8-

Descriptors: *Remote sensing, *Water resources, *Colorado, Water temperature, Snow surveys, Water yield, Sedimentation, Erosion, Clouds,

Identifiers: *Wolf Creek watershed(Colo).

Remotely sensed data were collected in the Wolf Creek watershed in southwestern Colorado over a 1-year period. Cloud top temperatures were mea-sured using a radiometer. Thermal imagery of the Wolf Creek Pass area was obtained during one predawn flight. Remote sensing studies of water resource problems were also conducted. Remote sensing techniques assist in the solution of water resource problems. Photogrammetric determination of snow depths is feasible. Changes in turbidity or suspended material concentration can be ob-served. Surface turbulence can be related to bed scour. Thermal effluents into rivers can be monitored. (Knapp-USGS) W74-12072

WATERSHED MODELLING USING A SOUARE GRID TECHNIQUE.

Waterloo Univ. (Ontario). Dept. of Civil Engineer-

ing. N. Kouwen.

In: Proceedings of Canadian Society for Civil Enin: Proceedings of Canadian Society for Civil En-gineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publi-cation No 4, p 418-434, 1973.

Descriptors: *Mathematical models, *Rainfall-runoff relationships, "Storm runoff, *Runoff forecasting, *Canada, Infiltration, Water storage, Discharge(Water), Finite element analysis.

A typical Southern Ontario watershed was simuhyperal source of the same watershed was simulated using storage discharge relationships for 1 km x 1 km square elements. With the model, hydrographs may be based on forecast weather, especially with regard to the prediction of flood peaks based on presumed weather conditions. Precipitation data measured by radar may be used in calculating storm runoff during a storm to aid in the operation of dams. Runoff passes through successive square elements to lower elevations. The elements are ordered with respect to their elevation and calculation proceeds in a downstream sequence. For each element there exists: a channel capacity-drainage area function; a surface storage-

channel inflow function; a surface storage-infiltration function; a subsurface storage-channel inflow function; and a channel storage-channel discharge function. (See also W74-12087) (Knapp-USGS) W74-12105

SEQUENTIAL GENERATION OF STREAM-

Indian Inst. of Tech., New Delhi, Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E. W74-12281

TWO-DISTRIBUTION METHOD FOR MODEL-ING AND SEQUENTIAL GENERATION OF MONTHLY STREAMFLOWS,

Illinois State Water Survey, Urbana. Hydrology Section

For primary bibliographic entry see Field 2E. W74-12283

BASSETT CREEK WATERSHED MODEL,

Barr Engineering Co., Minneapolis, Minn.

L. J. Kremer.

Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 789-793, August 1974. 3 fig, 5 ref.

Descriptors: *Minnesota, *Watersheds(Basins), *Model studies, *Urban hydrology, Hydrograph analysis, Synthesis, Surface waters, Floods, Flood control, Hydrology, Runoff, Surface runoff, Storm runoff, Urbanization. Identifiers: Minneapolis(Minn), *Bassett Creek

Watershed(Minn).

A synthetic hydrograph method was utilized in the development of a watershed model for a small ur-banizing watershed. The model was applied to the watershed and the largest flood of record was accurately reproduced. Because the model would be utilized for design of flood control plans with complete urbanization, the method was also applied to an urbanized watershed and reproduced a measured event with good results. The method does not require extensive hydrologic data for its implementation, can be applied to watersheds in various stages of urbanization, and permits consideration of natural or potential floodwater storage. (Dawes-ISWS) W74-12285

THE APPLICATION OF RIDGE REGRESSION ANALYSIS TO A HYDROLOGIC TARGET-CONTROL MODEL,

Wyoming Univ., Laramie. Dept. of Statistics and Atmospheric Resources.
For primary bibliographic entry see Field 2E. W74-12286

WATERPROOFING SURFACE-ZONE SOIL AG-GREGATES FOR WATER CONSERVATION, Hebrew Univ., Rehovot (Israel). Faculty of

Agriculture. For primary bibliographic entry see Field 2G.

PROCEDURES FOR FILLING GAPS IN HYDROLOGIC EVENT SERIES, Pennsylvania State Univ., Harrisburg. Dept. of

Civil Engineering.
For primary bibliographic entry see Field 2E. W74-12291

ECOSYSTEM MODELING OF A FORESTED

RIVER BASIN. Washington Univ., Seattle. Coll. of Forest Resources J. A. Ryan, I. G. Morison, and J. S. Bethel.

Group 2A-General

Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 703-709, August 1974. 11 ref.

Descriptors: *Ecosystems, *River basins, *Forest watersheds, *Runoff, Model studies, Forest management, *Washington, Land use, Environ-mental effects, Precipitation, Evapotranspiration,

mental effects, Precipitation, Evaportanspiration, Sediment load, Simulation analysis. Identifiers: Physical parameters, *Deterministic models, *Snohomish River Basin(Wash), Stream temperature, Multiple player management game, Cascade Mountains(Wash), Resource management. Detention storage.

The forest ecosystem of the Snohomish River Basin in the Cascade Mountains of western Washington was modeled to develop an effective decision tool for evaluating environmental impacts resulting from land and forest management practices. A computer simulation model dealt with physical subsystems including product conversion, forest production, recreation supply, wildlife and fisheries, and the interaction of these processes with the water and atmosphere. This model was interfaced with a multiple player management game which enabled land managers, manufacturers, and regulators to make decisions and respond to environmental effects. Responses of the hydrologic system to management decisions were simulated by the water subsystem model. The model emphasized non-point as well as point source impacts. Since the significance of impacts varies with land use and goals of the game players, the model had flexible resolution and was able to predict conditions for both large and small scale. The water subsystem model responded to management decisions by game players for 40 acre cells within the Basin. The model determined which streams were affected, defined the contributing watershed, and extracted model parameters and information from a data bank. Using these parameters and precipitation inputs, mean flow on parameters and precipitation inputs, mean flow on monthly and annual bases was calculated for the impacted subwatersheds and the 21 major watersheds of the Basin. Water quality responses calculated were suspended sediment concentra-tion and stream temperature increase due to expo-sure (Adams_ISWS) sure. (Adams-ISWS) W74-12294

DECISION ANALYSIS OF A GAMMA HYDROLOGIC VARIATE. DECISION Arizona Univ., Tucson. Dept. of Systems and In-

dustrial Engineering. For primary bibliographic entry see Field 2B.

W74-12301

THE KERNEL FUNCTION OF LINEAR NONS-TATIONARY SURFACE RUNOFF SYSTEMS, Technion - Israel Inst. of Tech., Haifa. Faculty of Civil Engineering. For primary bibliographic entry see Field 2E. W74-12302

ACCURACY OF PRECIPITATION MEASURE-MENTS FOR HYDROLOGIC MODELING, Silver Spring, Md. National Weather Service, Hydrologic Research and Development Lab. For primary bibliographic entry see Field 2B. W74-12304

THE DESIGN OF RAINFALL NETWORKS IN TIME AND SPACE,

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 2B. W74-12312

STREAM FLOW CHARACTERISTICS OF: GREENBRIER RIVER SUB-BASIN, West Virginia Dept. of Natural Resources, Char-

leston. For primary bibliographic entry see Field 7C. W74-12323

THEORETICAL JUSTIFICATION OF PEARSON DISTRIBUTION CURVES.

Soviet Hydrology: Selected Papers, No 1, p 71-76, 1973. 7 ref. Translated from GGI, Sbornik rabot po

gidrologii, No 10, p 110-118, 1973

Descriptors: *Statistical models, *Mathematical studies, *Mardov processes, *Synthetic hydrology, Probability, Stochastic processes, Statistical methods, Hydrographys, Statistics, Analytical techniques, Theoretical analysis.
Identifiers: *Pearson distribution curves.

Probability distribution curves in the form of a Pearson probability curve of type III have been extensively used in Soviet hydrologic practice as a useful and flexible means of smoothing and ex-trapolating hydrologic distributions. The Markov distribution served as a theoretical justification of the most important types of distribution curves in-troduced by Pearson. The mathematical development showed that Pearson Curves can be justified theoretically and cannot be regarded only as a successful empirical means of smoothing statistical distributions. (Humphreys-ISWS) W74-12328

METHOD FOR COMPUTING NORMAL GROUNDWATER DISCHARGE INTO SMALL RIVERS,

For primary bibliographic entry see Field 2F. W74-12331

HYDROLOGICAL ANALYSES USING AT-MOSPHERIC VAPOR DATA, Connecticut Univ., Storrs. Inst. of Water

P. Bock, P. Magyar, and A. N. Shahane. Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 077; \$3.00 in paper copy, \$2.25 in microfiche. Completion Report, 1974. 10 p. OWRR A-033-CONN(3). OWRR 14-31-0001-3807.

Descriptors: *Parametic hydrology, *Meteorology, *Drainage area, *Hydrologic cycle, *Statistical methods, *Computer models, Meteoric water, Precipitation(Almospharical Water storage, Evapotranspiration. Identifiers: Hydrometeorological water, Precipitation(Atmospheric), Runoff, approach.

Hydrologic components, Atmospheric divergence, Atmospheric vapor.

An interdisciplinary methodology based on hydrologic, statistical and computer principles is used to demonstrate that a hydrometeorological approach can provide reasonable estimates of hydrologic components for both smaller drainage areas, varying in size from 20,000 sq. mi. to 58,000 sq. mi., and larger drainage areas, which are formed by combining individual areas in random or systematic fashion. In this way, the time series of seven hydrologic components are generated for 26 smaller and 10 larger (combined) drainage areas of the United States. These generated series of input and output quantities are further subjected to the statistical analyses which include autocorrelation analysis, spectral and cross spectral density techniques, two way analysis of variance, and simple correlation theory. The geographic distribu-tion of statistical parameters of these hydrologic scries is compared with the available maps of various meteorological and physical features. Such comparisons reflect the adequate correlation between these computed statistical parameters and physical factors. The computer simulation procedure is developed to estimate the maximum and minimum 'design' values for the seven hydrologic components of the United States. (deLara-Connecticut)

2B. Precipitation

SELECTED BIBLIOGRAPHY ON WATER BALANCE OF MONSOON ASIA (III), Meteorological Research Inst., Tokyo (Japan).

I. Tsuchiya

Available from NTIS, Springfield, Va. 22161 as N73-27531, Price \$3.25 printed copy; \$2.25 microfiche. Hosei University Climatological Notes, No 11, 1973. 22 p.

Descriptors: *Water balance, *Asia, *Monsoons, **Climatology, *Bibliographies, Abstracts, V seasons, Hydrologic budget, Hydrologic cycle. Identifiers: *Japan, *Southeast Asia.

This bibliography of the water balance of Monsoon Asia covers Southeast Asia, Japan, and surrounding areas. The topics are climatological approaches to water balance and water resources problems. Wider regional analyses were selected from the articles on Japan. The bibliography contrion the articles of spani. The biolography contains 171 article references with subject annotations and 33 climatological data references. (Knapp-USGS) W74-12019

INSTRUCTION MANUAL FOR EXPENDABLE

DEW POINT HYGROMETER. EG and G International, Inc., Waltham, Mass. Environmental Equipment Div.

Available from NTIS, Springfield, Va 22161 as AD-760 810, Price \$3.00 printed copy; \$2.25 microfiche. Air Force Cambridge Research Laboratories Technical Report 73-0297(11), January 1971. 50 p, 6 fig. AF F19628-69-C-0173.

Descriptors: *Meteorological data, *Humidity, *Telemetry, *Hygrometry, *Instrumentation, Automation, Moisture meters.

Identifiers: *Hygrometers.

An expendable dew point hygrometer was designed for tropospheric balloon soundings. It is designed to the designed to be used in conjunction with a radiosonde in gathering meteorological data. The measurement of dew point temperature is accomplished by a thermistor mounted in a dew point sensor which senses temperature as a resistance and provides a signal to the radiosonde. The radiosonde is a balloon-borne, battery powered, meteorological instrument that automatically transmits radio signals relating to the atmosphere pressure, air temperature and dew point temperature of the upper air to ground receiving equip-ment. (Knapp-USGS) W74-12078

FOG CLEARING USING HELICOPTER DOWNDRAFTS: A NUMERICAL MODEL, Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
For primary bibliographic entry see Field 3B.
W74-12081

A PHYTOCLIMATIC APPROACH TO THE PROBLEM OF MEDITERRANEITY IN THE INDO-PAKISTAN SUB-CONTINENT, V. M. Meher-Homii

V. M. Mener-Homji.
Feddes Repert Z Bot Taxon Geobot. Vol 83, No 9/10, p 757-788, Illus, 1973.
Identifiers: Cedrus-deodara, *Climatic conditions, *Evergreen forests, *Mediterraneity, Oleacuspidata, *Pakistan, Pistacia-khinjuk, Pistacia-mutica, Punica-granatum, Quercus-baloot, Rains, Sclarophyllous, Season, Temperatur, *Mediterraneity, *Oleacus, Temperatur, *Mediterraneity, *Oleacus, Temperatur, *Pakistan, *Pakistan, Temperatur, *Pakistan, *Pakistan, Temperatur, *Pakistan, Sclerophyllous, Season, Temperature, *India

In the northwest part of the sub-continent, winter-spring rains coupled with low temperature and dry, hot summer create Mediterranean conditions. Variants may be recognized in relation to aridity, temperature of the coldest month and intensity of summer dryness based on the contribution of average summer rainfall and rainy days to the an-

nual total, percentage frequency of estival rainfall and rainy days, percentage number of years show-ing mediterranean regime. The degrees of Mediterraneity (pure, moderate, attenuated) recognized according to the above criteria are supported by phytogeographic evidence. Dry evergreen sclerophyllous forests, with one or more of the typical mediterranean species like Olea cuspidata, Pistacia khinjuk, P. mutica, Quercus baloot, Punica granatum, Cedrus deodara occur under a moderate degree of Mediterraneity. Some of these and few others of mediterranean stock persist under attenuated degree, though the forest physiognomy is not well developed. The floristic elements viz., Mediterranean, tropical, arid zone and general, show close correlations with the degrees of Mediterraneity, aridity and temperature regimes.--Copyright 1974, Biological Abstracts, Inc. W74-12162

ON THE SYNTHESIS OF RANDOM FIELD SAMPLING FROM THE SPECTRUM: AN AP-PLICATION TO THE GENERATION OF HYDROLOGIC SPATIAL PROCESSES, Instituto Venezolano de Investigaciones Cien-

tificas Caracas

J. M. Mejia, and I. Rodriguez-Iturbe. Water Resources Research, Vol 10, No 4, p 705-711, August 1974. 3 tab, 4 ref. NOAA Contract 2-36235, OWRR Grant 14-31-0001-9021.

Descriptors: *Synthesis, *Spatial distribution, *Frequency, *Temporal distribution, *Rainfall, Correlation analysis, Isotropy.
Identifiers: *Spectral density function,
*Harmonics, Random frequencies, Ergodic, Multivariate process.

A procedure for the synthesis of processes ex-A procedure for the synthesis of processes ex-hibiting temporal and spatial variability was presented. The method involved the addition of harmonics of random frequencies that were sam-pled from the spectral density function or the radial spectral density function. The process obtained was asymptotically Gaussian and ergodic. The scheme presented can be utilized for synthetic generation of spatial processes such as rainfall. The method provides a specified way to study areal extremes in precipitation and differences with respect to point extreme rainfall. An estimate of the error in time or space averages due to the nonergodicity of the process as a function of the number of harmonics was also included. (Bhowmik-ISWS) W74-12295

DECISION ANALYSIS OF A GAMMA HYDROLOGIC VARIATE,

Arizona Univ., Tucson. Dept. of Systems and In-dustrial Engineering.

dustrial Engineering. S. Yakowitz, L. Duckstein, and C. Kisiel. Water Resources Research, Vol 10, No 4, p 695-704, August 1974. 2 fig, 7 tab, 25 ref. NSF Grants GK-35791 and GK-35915.

Descriptors: *Storms, *Rainfall, *Runoff, *Decision making, *Statistical models, Simulation analysis, Monte Carlo method, Parametric hydrology, *Arizona.

Identifiers: Poisson variate, Bayesian, Exponen-

tial family, Gauss-Legendre quadrature, Gamma family, Deterministic watershed model, Winter storms, *Tucson(Ariz).

Study was devoted to the quantitative analysis of winter-type rainfall and its subsequent use in deci-sion analysis. Results indicated that the exponential family did not statistically fit the rainfall per event in winter storms. Statistical tests indicated that the gamma family described the precipitation process of winter storms for the Tucson rainfall record. A natural conjugate family for the gamma law was derived and discussed. Numerical methods for Bayesian analysis of the gamma variate were explained and tested on simulated data. Examples of decision making when the gamma family is the underlying law were also described. The method of decision analysis presented can be applied to other hydrologic problems in which the gamma distribution, also called the Pearson type 3, is a plausible model. It was concluded that the bulk of the numerical methods derived will prove useful in many other Bayesian decision theory contexts. (Bhowmik-ISWS)

ACCURACY OF PRECIPITATION MEASURE-

MENTS FOR HYDROLOGIC MODELING, Silver Spring, Md. National Weather Service, Hydrologic Research and Development Lab.

L. W. Larson, and E. L. Peck. Water Resources Research, Vol 10, No 4, p 857-863, August 1974. 7 fig, 2 tab, 28 ref.

Descriptors: *Precipitation(Atmospheric), *Rain gages, *Instrumentation, Watersheds(Basins), Cyclones, Hydrologic data, Precipitation gages, Effective precipitation, Hydrologic cycle, Cyclones, Hydrologic data, Free Cyclones, Hydrologic data, Hydrologic cycle, Effective precipitation, Hydrologic cycle, Hydrology, Winds, Clouds, Storms. Identifiers: *Gage shields, *Gage catch deficientifiers: *Gage shields, *Gage shields cies, *Pemigewasset River
*Precipitation input, Meteoric water.

The use of precipitation data as input for conceptual models has enhanced the need for measure-ments more representative of 'true' precipitation. Precipitation input to continuous watershed models is generally some form of mean basin precipitation estimate based on point measure-ments. Each point measurement can have large catch deficiencies due to wind, especially for solid precipitation. A brief review was made of past results from studies concerned with these defi-ciencies. New curves based on current studies were presented for wind-caused gage catch defi-ciencies for both rain and snow. The results of using gage catch correction factors to adjust precipitation input to a conceptual hydrologic model were presented. (Roberts-ISWS)

THE DESIGN OF RAINFALL NETWORKS IN TIME AND SPACE.

Massachusetts Inst. of Tech., Cambridge. Dept. of

Massachusetti Ms. of Tech., Cambridge Dept. of Civil Engineering. I. Rodriguez-Iturbe, and J. M. Mejaijn. Water Resources Research, Vol 10, No 4, p 713-728, August 1974. 12 fig. 9 tab, 23 ref. NOAA Con-

Descriptors: *Rainfall, *Networks, *Design, Time, Water resources, Planning, Management, Water balance, Hydrologic budget, Equations, Mathematical studies, Cyclones, Probability, Hydrologic data, Precipitation(Atmospheric), Net-

Works: *Spatial sampling, *Variance reduc-tion factor, *Covariance function, Random design, Bessel-Type correlation, Areal mean, Long-Term mean, Areal rainfall, Space, Rainfall process, Development.

A methodology for the design of precipitation net-works was formulated. The network problem was discussed in its general conception and then focus was made on networks to provide background in-formation for the design of more specific gaging systems. The rainfall process was described in terms of its correlation structure in time and space. A general framework was developed to estimate the variance of the sample long-term mean areal precipitation and mean areal rainfall of a storm event. The variance was expressed as a function of correlation in time, correlation in space, length of operation of the network, and geometry of the gag-ing array. The trade of time versus space was quantitatively developed, and realistic examples were worked out showing the influence of the net-work design scheme on the variance of the esti-mated values. (Roberts-ISWS) HYDROLOGICAL ANALYSES USING AT-MOSPHERIC VAPOR DATA. Connecticut Univ., Storrs. Inst. of Water

Resources. For primary bibliographic entry see Field 2A. W74-12596

METEOROLOGICAL CRITERIA FOR EXTREME FLOODS FOR FOUR BASINS IN THE TENNESSEE AND CUMBERLAND RIVER WATERSHEDS,
National Weather Service, Silver Spring, Md. Hydrometeorological Branch.

F. K. Schwarz. Available from Sup Doc, GPO, Washington, D C 20402, Price \$0.90 domestic postpaid; \$0.65 GPO Bookstore. National Oceanic and Atmospheric Administration Hydrometeorological Report No 47, May 1973. 59 p, 27 fig, 13 tab, 8 ref. TVA Con-tract TV-36522A.

Descriptors: *Floods, *Maximum probable flood, *Tennessee Valley Authority, Reservoirs, *Tennessee River, Flood forecasting, Rainfall-runoff relationships, Probable maximum precipitation, Weather patterns.
Identifiers: *Cumberland River(Tenn).

Rainfall criteria are given which permit definition of maximum flood levels along the Tennessee River from the mouth upstream to TVA's Browns Ferry Nuclear Plant at mile 294. In 1968 maximum rainfall depths were defined for the 16,170-sq-mi drainage area above the Browns Ferry plant and below TVA's major tributary dams. In 1970 the study was extended to include the 26,780-sq-mi drainage area above Kentucky Dam and below TVA's major tributary dams. This latter study included definition of concurrent rainfall expected on the Cumberland Basin as required to evaluate the effects of the canal which connects the two rivers just upstream of Kentucky Dam. Studies were made in 1971 to provide rainfall criteria for defining maximum flood levels along the Cumberland River above Old Hickory Dam. This required defining rainfall for both the 11,674-sq-mi drainage area above the dam and the 2,734-sq-mi watershed between Old Hickory and the next major upstream dams, Center Hill, Dale Hollow, and Wolf Creek. (Knapp-USGS) W74-12636

RELATION OF CLIMATE TO LEACHING OF SOLUTES AND POLLUTANTS THROUGH

SOILS, Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 5B. W74-12645

INTERCEPTION OF RAINFALL BY HARD BEECH (NOTHOFAGUS TRUNCATA) AT TAITA, NEW ZEALAND,

Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau. R. Aldridge, and R. J. Jackson. N Z J Sci. Vol 16, No 1, p 185-198. 1973. Illus.

Descriptors: *Stemflow, Throughfall, Rainfall, *Precipitation(Atmospheric), Soil moisture. Identifiers: *Beech, Fagus-spp, Flow, *New Zea-land, Nothofagus-truncata, Stem, Taita, Winter,

Throughfall and stemflow were measured in a Throughfall commenced when gross rainfall exceeded 0.5 mm. For storms with gross rainfall greater than 10 mm, 45-50% of it reached the ground as throughfall. The presence of scars resulting from fires made most trunks unsuitable for stemflow measurement, but data were ob-tained from 2 trunks with breast-height diameter (d.b.h.) 0.25 m and one with 0.6 m d.b.h. Stemflow commenced when gross rainfall exceeded 1.3 mm. For storms with gross rainfall greater than 10 mm,

Group 2B-Precipitation

stemflow was 20-25% and 10-15% of gross rainfall from the small and large trees respectively. Stemflow was greater when rain was accompanied by strong winds than in storms with light winds. The proportion of gross rainfall reaching the ground as stemflow is similar to that found in studies on beech (Fagus) species in the Northern Hemi-sphere. Significant effects of stemflow on soil moisture distribution and on soil properties are expected. In winter the interception loss was much greater than conventional estimates of potential evapotranspiration .-- Copyright 1974, Biological Abstracts, Inc. W74-12683

2C. Snow, Ice, and Frost

STRENGTH CALCULATIONS OF ICE COVER,

D. F. Panfilov. Available from NTIS, Springfield, Va. 22161 as AD-762 105, Price \$3.00 printed copy; \$2.25 microfiche. Army Foreign Science and Technology Center Translation, March 1973. 9 p, 2 fig, 1 tab, 18 ref. (Trans. from Stroitel'stvo i Arkhitekturz, Vol 6, p 128-133, 1970).

Descriptors: *Ice, *Ice cover, *Strength of materials, *Mohr failure theory, Rivers, Lake ice, Failure(Mechanics), Theoretical analysis.

When the ice cover of rivers and inland waters is used for construction, exploration, and transportation, it is necessary to calculate its carrying capaci-ty. Ice at any temperature fails as a brittle material. The equations given are applicable only at below-freezing ambient air temperatures. With the onset of thaw, the ice becomes weakened, and its carrying capacity is reduced. (Knapp-USGS) W74-12010

UNITED STATES GEOLOGICAL SURVEY ALASKA PROGRAM, 1974. Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 4A. W74-12012

CHARACTERISTICS OF SEA ICE, LAKE ICE AND PERMAFROST USING AN IMPULSE RADAR SYSTEM,

Geophysical Survey Systems, Inc., Worth Biller-

ica, Mass. C. L. Bertram, K. J. Campbell, and S. S. Sandler. Available from NTIS, Springfield, Va 22161 as AD-772 549, Price \$4.00 printed copy; \$2.25 microfiche. Technical Report No 008-72, May 1972. 65 p, 33 fig, 3 tab, 7 ref. ONR Contract N00014-71-C-0392.

Descriptors: *Radar, *Ice, *Permafrost, Sounding, Instrumentation, Frozen ground, Frozen soils, Ice cover, Frost, Sea ice, Iced lakes, Sur-

An impulse radar system was developed to perform shallow subsurface investigations. The technique, known as Electromagnetic Subsurface Profiling, is the electrical analog of the seismic subbottom profiling method used in marine geology. The radar system operates by detecting the in-terface between two materials having different electrical properties. For sea ice and lake ice, an electromagnetic pulse is generated near the ice surface and the reflections from the surface and the ice-water interface are displayed on a continu-ous strip-chart recorder. Travel times of the reflected pulses can be converted directly to ice thickness if the effective dielectric constant is known. Likewise, if the ice thickness is known the effective dielectric constant can be determined. Large masses of ground ice in permafrost have been located with the system. Theoretical con-siderations indicate that the system also should be able to determine the approximate volume of in-terstitial ice in frozen soils. (Knapp-USGS) W74-12053

THE INTERDEPENDENCE OF LAKE ICE AND CLIMATE IN CENTRAL NORTH AMERICA, Wolf Research and Development Corp., River-

dale, Md.

A. J. Jelacic Available from NTIS, Springfield, Va 22161 as Fight Center, December 1973, 27 p, 6 fig, 3 tab, 8 ref. NASA Contract NAS-5-21761.

Descriptors: *Lake ice, *Ice cover, *Freezing, *Climatology, i*Remote sensing, Satelites(Artificial), Surveys, Meteorology, Synoptic analysis, Canada, United States, North America.

Correlations between the freeze-thaw cycles of lakes and regional weather variations were studied using ERTS 1 imagery of central Canada and north central United States. A comparison of lake freeze transition zone migration with the movement of large pressure centers revealed the following consistencies: (1) polar continental cyclones originate within and/or travel along the trend of the transi-tion zone; (2) polar continental anticyclones fail to cross the transition zone, and (3) polar outbreak anticyclones pass through the transition zone, ap-parently unaffected. In addition, storm centers as sociated with the transition zone undergo significant intensification manifest by a deepening of the pressure through and increased precipitation outside the zone. (Knapp-USGS)

RESISTANCE TO FLOW IN ICE COVERED RIVERS--A SIMULATION STUDY WITH ARTIFICIAL ROUGHNESS,

New Brunswick Univ., Fredericton. For primary bibliographic entry see Field 8B. W74-12092

HYDRAULIC INFLUENCES ON AUFEIS

R. F. Carlson, and D. L. Kane In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publi-cation No 4, p 165-175, 1973. 5 fig, 5 ref.

Descriptors: *Ice, *Alluvial channels, Freezing, *Alaska, Roads, Highways, Design, Surfacegroundwater relationships, Groundwater move-

Identifiers: *Icings, *Aufeis growth, *Naleds

The hydraulic mechanism of aufeis growth is the result of a complex interaction of open channel, closed conduit, and groundwater flow. Results of a field measurement program on a small stream near Fairbanks, Alaska illustrate rapid and complicated fluctuation of hydrostatic head in the stream and the adjacent groundwater aquifer in conjunction with aufeis growth. A very important role is played by the adjacent groundwater aquifer as a storage reservoir. An understanding of the interaction of groundwater and streamflow is necessary for the development of design criteria where various transportation facilities intersect streams that have a potential for aufeis accumulation. (See also W74-12087) (Knapp-USGS) W74-12095

SNOW-AIR INTERACTIONS AND MANAGE-MENT OF MOUNTAIN WATERSHED SNOW-

Colorado State Univ., Fort Collins. Dept. of Earth

Resources.

J. R. Meiman, and L. O. Grant. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 825 33.25 in paper copy, \$2.25 in microfiche. Comple-tion Report Series No. 57, Colorado Environmental Resources Center, Fort Collins, June 1974, 36 p. 3 fig, 6 tab, 11 ref, append. OWRT-B-073-Colo, 14-31-0001-3568. Descriptors: Evaporation, *Snow management, Alpine. *Snowpack, *Cirques, Watershed Alpine, *Snowpack, *Cirques, Watershed management, Rocky Mountain region, Colorado, Avalanches, *Hydrologic budget. Identifiers: *Colorado Front Range Climax(Colo.), Pingree Park(Colo.), avalanching, Cornice blasting. Induced

Evaporation losses from mountain snowpacks amounted to approximately 60% of the snow season precipitation in an alpine setting and to approximately 45% in both a forest opening. Forest clearings similar to those studied should not result in greater snow evaporation losses if they are kent small enough to prevent wind transport of snow. Periodic removal of ridgeline snow deposits into the cirque below resulted in an increase of water yield equivalent to 240 acre-feet of water per mile of ridgeline treated. The estimated cost of the increased runoff was approximately \$50 per acrefoot discharged from the cirques. A water-budget analysis of the alpine feeder area indicated that nearly 80% of the seasonal precipitation was transported out of the region by the end of the winter study period, 30 April. Only 23% of this total transport (18% of seasonal precipitation was caught in the natural cornice deposits along the ridgeline. It was shown that the cornice location is an inefficient place to store the windblown snow. Less than one-third of the winter storage in these ridgeline deposits was available for runoff. The remaining two-thirds was lost to either evapo-sublimation or late melt occurring after the runoff from the cirques had ceased. In the study area there is no carry-over of the ridgeline deposits into the next season. The water-budget analyses for the cirques indicated that nearly 75% of the water stored in the cirques during the winter period was realized as runoff during the melt period. W74-12201

ENVIRONMENTAL GUIDELINES DEVELOPMENT ROADS IN THE SUBARCTIC, Environmental Protection Agency, College Alaska. Arctic Environmental Research Lab. For primary bibliographic entry see Field 5G. W74-12223

TRANSVERSE MIXING IN AN ICE-COVERED

Alberta Univ., Edmonton. Dept. of Civil Engineer-For primary bibliographic entry see Field 2E. W74-12293

A TECHNIQUE TO OBTAIN ICE MOVEMENT. Alaska Univ., College. Geophysical Inst. G. Wendler, and K. O. L. F. Jayaweera. Journal of Geophysical Research, Vol 79, No 24, p 3478-3479, August 20, 1974. 1 fig, 1 ref. NOAA, sea-grant 04-3-158-41.

*Sea ice, *Remote sensing, Descriptors: Surveys, *Velocity, Icebergs, Sea water, Satellites(Artificial), Data collections, Photography, Analytical techniques, Measurement, Evaluation, Movement. Identifiers: *Norton Sound(Bering Sea).

A technique of using satellite imagery was presented so as to obtain without ambiguity the velocity vector of sea ice movement. The satellite imagery of the same area at two different times, i.e., a 24-hour difference was subtracted by superimposing a positive transparency of one and the negative of the other. Ice floes that have moved appeared on the resultant imagery twice, one lighter and one darker than the background. (Humphreys-ISWS) W74-12314

Streamflow and Runoff—Group 2E

DEPENDENCE OF PHOTOSYNTHESIS ON TEMPERATURE IN TUNDRA PLANTS OF WRANGEL ISLAND, (IN RUSSIAN), Akademiya Nauk SSSR, Leningard. Botanicheskii

For primary bibliographic entry see Field 2I. W74-12481

CAN FREEZING IMPROVE WELLS IN CON-SOLIDATED ROCK AQUIFERS,
Food and Agriculture Organization of the United

Nations, Rome (Italy). Land and Water Development Div. For primary bibliographic entry see Field 4B. W74-12532

2D. Evaporation and Transpiration

EXPLANATION OF THE DAILY PATTERN OF WATER EVAPORATION FROM THE SOIL.

Zh.-D. Dandaron.

Zn.-D. Dandaron. Soviet Hydrology: Selected Papers, No 1, p 77-85, 1973. 4 fig, 2 tab, 8 ref. Translated from GGI, Sbornik rabot po gidrologii, No 10, p 188-200, 1973.

Descriptors: *Evaporation, *Soil moisture, *Airearth interfaces, *Diurnal distribution, Soil water movement, Soil surfaces, Hygroscopic water, Boundary processes, Diffusion, Temperature, Soil profile, Hydrologic equation, Hydrology, Fringe water, Soil temperature, On-site investigations, On-site tests, Soil investigations.
Identifiers: USSR.

An equation to compute the daily pattern of evaporation from the soil was obtained by solving a diffusion equation with allowance for sorption and desorption taking place during temperature changes in a dry layer formed at the soil surface. At the limit, when the thickness of the dry layer approaches zero, the equation leads to the formula of evaporation from the water surface (moist soil).
Water evaporation from the soil represented a superposition of the diffusion flux, across the dry layer, of the vapor formed in deeper layers, and vapor formed or adsorbed in the dry layer as a result of desorption and sorption, respectively. The thickness of the dry soil layer was one of the most important parameters determining the daily evaporation pattern. With a thin dry layer, the evaporation pattern was determined mainly by the diffusion of vapor forming in the deeper soil layers. With a thick dry layer, the evaporation pat-tern was determined chiefly by sorption and desorption in this layer during periodic changes in desorption in this layer during periodic changes in soil temperature. The daily pattern of evaporation from the soil, computed by the equation agrees satisfactorily with the data from a hydraulic evaporimeter. (Humphreys-ISWS) W74-12330

TREE WATER STRESS IN RELATION TO WATER YIELD IN A HARDWOOD FOREST,

New Hampshire Univ., Durham. Water Resource

Research Center. C. A. Federer, and G. W. Gee. Available the from National Technical Informa-Available the from National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 047, \$3.25 in paper copy, \$2.25 in microfiche. Research Report No 7, July 1974, 30 p, 1 fig, 1 tab, 12 ref. OWRT A-025-NH(3), 14-31-0001-3229.

Descriptors: *Stomata, *Transpiration, Microenvironment, Moisture deficit, *Deciduous forests, *Hardwood, Water yield improvement, *Energy budget, Xylem, *New Hampshire, Trees, Soilwater-plant relationships, Leaves.
Identifiers: *Ephemeral, Single-leaf energy

Stomatal resistance, xylem potential, soil-water potential, stem diameter, net radiation, air tem-perature, humidity and wind were measured through a summer in a northern hardwood forest and on sunny and shady edges of clearings. Rainfall was about normal, and stomatal closure due to water stress occurred only as an ephemeral midday phenomenon. Yellow birch had lower diffusion resistance (2.5 sec/cm) than beech and sugar maple (3.0 and 3.4), implying possible transpirational differences. Diffusion resistance varied by species during leafout; it remained low in autumn until leaves turned color. Several trees were artificially stressed by preventing rain from reaching their roots; after two weeks stomata began to close early in the day, presumably limited transpiration and growth. The single-leaf energy balance was found to work on leaves in the canopy within the limits of measuring accuracy. Transpiration of trees on the edges of forest openings is probably greater than if there were no opening due to in-creased radiation and clothesline advection. A single large clearcut will reduce evapotranspiration more and provide greater water yield increase than cutting the same forest area in a number of smaller blocks W74-12362

EFFECT OF PARTIAL VEGETATION AND TOPOGRAPHIC SHADE ON RADIANT ENERGY EXCHANGE OF STREAMS—WITH APPLICATIONS TO THERMAL LOADING TO PROBLEMS.

Pennsylvania State Univ., University Park. School of Forest Resources.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 073; \$4.50 in paper copy, \$2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Research Publication Number 82, June 1974. 105 p, 16 figs, 11 tab, 17 ref. OWRT B-043-PA(1). 14-31-0001-3637.

Descriptors: *Solar radiation, *Thermal radiation, *Vegetation effects, Topography, *Water tem-perature, Streams, *Heat budget, *Thermal pollution, Model studies.

A model was developed and tested for estimation of the effects of partial vegetative and topographic shade on radiation exchange of streams. Theoretireflected solar, transmitted solar radiation, and both terrestrial and atmospheric longwave radiation were analyzed. Theoretical and measured downward allwave radiation flux densities compared favorably for a stream partially shaded by vegetation during four summer days. Theory and measurements were used to estimate daily and diurnal shade effects on radiation exchange of streams. Maximum shade-induced reductions in daily absorbed solar plus downward longwave radiation occurred for N-S stream azimuths, clear days, and large shade altitudes. Reductions were negligible on streams large enough to be sinks for waste heat, but could be significant on small streams especially if diurnal variations in radiation exchange were considered. Shade effects on heat dissipation from thermally-loaded streams were inferred from heat balance data W74-12598

INTERCEPTION OF RAINFALL BY HARD BEECH (NOTHOFAGUS TRUNCATA) AT TAITA, NEW ZEALAND,

Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau. For primary bibliographic entry see Field 2B. W74-12683

LOSSES OF NITROGEN AND OTHER PLANT NUTRIENTS TO DRAINAGE FROM SOIL UNDER GRASS, Grassland Research Inst., Hurley (England). For primary bibliographic entry see Field 5B. W74-12723

2E. Streamflow and Runoff

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1972, Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 7C. W74-12055

DRAINAGE AREAS OF TEXAS STREAMS, GUADALUPE RIVER BASIN. Geological Survey, Austin, Tex. For primary bibliographic entry see Field 7C. W74-12060

FLOW VISUALIZATION USING A SELECTIVI-

TY SENSITIVE FLUORESCENT DYE,
Aerospace Research Labs., Wright-Patterson
AFB, Ohio. D. R. Campbell.

D. R. Campbea. Available from NTIS, Springfield, Va 22161 as AD-761 499, Price \$3.00 printed copy; \$2.25 microfiche. Air Force Aerospace Research Laboratories Report ARL 73-0075, May 1973. 8 p, 4 fig. 3 ref.

Descriptors: *Tracers, Flow, *Flourescent dye, Tracking techniques. Identifiers: *Flow visualization.

A technique of flow visualization produces the equivalence of smoke lines in water. The method consists of a fluorescent dye material, acting as a consists of a fluorescent dye material, acting as a marker fluid, which is selectively responsive to ultraviolet light of a single wavelength. Under proper illumination, the dye provides a highly visible marker fluid, well suited to conventional photography. Under normal lighting conditions, the dye is colorless and optically noncontaminating. (Knapp-USGS) W74-12080

FIRST CANADIAN HYDRAULICS CON-FERENCE PROCEEDINGS.
Alberta Univ., Edmonton. Dept. of Civil Engineer-

For primary bibliographic entry see Field 8B. W74-12087

BACKWATER EFFECTS AT END-DUMPED CONSTRICTIONS ON ALLUVIAL CHANNELS, Directorate of Designs, Irrigation, Bhubaneswar For primary bibliographic entry see Field 8B. W74-12088

NUMERICAL MODEL STUDIES OF RIVERS NUMERICAL MODEL STUDIES OF RIVERS AND ESTUARIES, National Research Council of Canada, Ottawa (Ontario). Hydraulics Lab.

For primary bibliographic entry see Field 8B. W74-12101

A NUMERICAL MODEL FOR FLOW PAST A SPUR-DIKE, Windsor Univ. (Ontario). Dept. of Civil Engineer-For primary bibliographic entry see Field 8B. W74-12103

MULTIPURPOSE WATER RELA DEVELOPMENT IN URBAN AREAS, California Univ., Berkeley. Hydraulics Lab. For primary ibiliographic entry see Field 4A. W74-12226 RELATED

SEQUENTIAL GENERATION OF STREAM-Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering. S. K. Spolia, and S. Chander.

Group 2E-Streamflow and Runoff

Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 672-679, August 1974. 3 tab, 6 ref.

Descriptors: *Time series analysis. *Model studies, *Synthetic hydrology, Streamflow, Statistical methods, Hydrologic data, Analytical techniques, Correlation analysis, Probability, Average flow.

Identifiers: Residual series, Monthly streamflow, *India(Beas River).

An auto-regressive model was developed for hydrologic data simulation by transforming the observed monthly streamflows into a single residual series. The model developed was used for synthesizing 10 sequences, each of 100 year length, of monthly flows for the Beas River in India. The statistical parameters were calculated from the 49 year historical record of monthly streamflows. Sequences were also generated using the conventional auto-regressive model and an individual monthly streamflow series. A comparison of the sequences shows that the model developed and proposed in this paper is as good as the conventional auto-regressive model in preserving the mean and standard deviation of historical record. The proposed model requires less parameters than the conventional model for simulation of longterm dependence. (Singh-ISWS) W74-12281

TWO DISTRIBUTION METHOD FOR MODEL. ING AND SEQUENTIAL GENERATION OF MONTHLY STREAMFLOWS, Illinois State Water Survey, Urbana. Hydrology

Section

K. P. Singh, and C. G. Lonnquist.

Water Resources Research, Vol 10, No 4, p 763-773, August 1974. 6 fig, 2 tab, 21 ref.

Descriptors: *Synthetic hydrology, *Time series analysis, *Model studies, *Distribution patterns, Statistical methods, Streamflow, Hydrologic data,

Analytical techniques, Correlation analysis, Probability, Computer programs, *Illinois. Identifiers: Mixed distributions, *Sangamon River(III), *Two-distribution method, Random normal deviates, Sequential flow generation, Normal distribution, Pearson distribution.

Distributions of observed monthly streamflows at many gaging stations exhibit slight, moderate, or sharp reverse curvatures that cannot be accommodated by the commonly used classical distributions such as the normal and gamma (Pearson type 3) distributions applied to flows or their logarithms. The two distribution, essentially a bimodal distribution, fits most of these observed distributions very well. A unique and versatile method for modeling and sequential generation of monthly streamflows was presented. In order to assure the normality of the multivariate distribution of variables representing monthly flows, the flows or their logarithms were converted to standardized normal deviates by suitable transforms. The distributions of monthly streamflows generated by the two-distribution method fit best the observed flow distributions. Annual flows obtained by summing generated monthly flows fit the observed annual flows very well. The use of the two-distribution method can obviate arbitrary adjustments in generated monthly flows to bring the annual flows obtained from them in line with observed annual flows. (Singh-ISWS) W74-12283

BASSETT CREEK WATERSHED MODEL, Barr Engineering Co., Minneapolis, Minn. For primary bibliographic entry see Field 2A. W74-12285

THE APPLICATION OF RIDGE REGRESSION ANALYSIS TO A HYDROLOGIC TARGET-CONTROL MODEL.

Wyoming Univ., Laramie. Dept. of Statistics and

Atmospheric Resources.
D. A. Anderson, and R. G. Scott.

Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 680-690, August 1974. 1 fig, 2 tab, 10 ref. DOI 14-06-D-6801.

Descriptors: *Regression analysis, *Statistical methods, *Least squares method, Hydrographs, Hydrologic data, Gaging stations, Analytical techniques, Variability, Estimating, *Wyoming, Identifiers: *Wind River Range(Wy), *Ridge regression analysis, Regression coefficients.

The results of this study indicated not only improved stability of the regression estimates but also some improvement in predictive ability when ridge regression is used instead of ordinary regression analysis. In situations where the independent variables in a model are highly correlated with each other, ordinary regression analysis is not usually satisfactory. With nonorthogonal data, the least squares estimates obtained using the regression techniques are subject to large errors and instability. In 1970, Hoerl and Kennard proposed the ridge regression analysis to control the instability of least squares estimates. This analysis is based on decreasing the mean square error of the regression coefficients rather than on a minimum residual sum of squares for the ordinary regression analysis. A detailed computational procedure was presented for obtaining the ridge regression estimates. The proposed analysis has been used to investigate the stability of regression coefficients over 23 years of data collection from several control stations for estimating the streamflow at two target stations. The ordinary regression analysis yielded positive and negative regression coefficients, but the ridge regression analysis gave only positive regression coefficients. The regression coefficients were very nearly the same for dif-ferent sets of years using the ridge regression anal-ysis. (Singh-ISWS) W74-12286

PROCEDURES FOR FILLING GAPS IN HYDROLOGIC EVENT SERIES, Pennsylvania State Univ., Harrisburg. Dept. of

Civil Engineering.
G. Aron, and T. M. Rachford.
Water Resources Bulletin, Vol 10, No 4, p 719-727, August 1974. 5 fig, 5 tab, 2 ref.

Descriptors: *Synthetic hydrology, *Analytical techniques, *Flood frequency, Simulation analysis, Statistical methods, Floods, Statistics, Hydrologic data, Surface waters, Hydrology, Flood data, Annual flood, Flood discharge, Regression analysis.

Identifiers: Missing data, Beard's formula, Extending records.

Various methods for synthesizing missing records of floods were compared. Record gaps may be the result of a temporary interruption of gaging activities at the particular site or may constitute the years prior to the installation of a permanent gage, during which a few isolated measurements of exceptional flood stages were made. The rank adjustment method was used to compute synthetic floods when concurrent records were absent from gauges located on the same stream or a nearby watershed. For concurrent data available at two hydrologically related stream gauges, synthetic floods were computed by regression analysis and the rank matching method. It was recommended that regression analysis be used if the series were processed in a form ready for computer analysis. The rank matching method can be applied quickly without any statistical analysis and could be used with little loss in realiability if hand tabulation and plotting are used in the flood analysis. It may also be possible to obtain better results with the rank matching method by interpolating according to the geometric mean, or by a weighted interpolation of several adjacent flows, or some other scheme, but only with the penalty of additional computational effort. (Humphreys-ISWS)

TRANSVERSE MIXING IN AN ICE-COVERED

Alberta Univ., Edmonton. Dept. of Civil Engineer-

J. E. O. Engmann, and R. Kellerhals Water Resources Research, Vol 10, No 4, p 775-784, August 1974. 7 fig, 4 tab, 16 ref, 1 append.

Descriptors: *Mixing, *Ice cover, *Tracers, Fluorescent dye, Streamflow, Hydraulics, Flow characteristics, *Canada.

Identifiers: *Transverse mixing, *Alberta(Lesser Slave River), Velocity measurements, Meandering

Two tracer tests were conducted in Lesser Slave River in Alberta under similar conditions of flow depth, one under ice and the other under open water. Average transverse exchange (or mixing) coefficients for a reach were computed using a curvilinear coordinate system and the moments technique of Aris. The normalized exchange coefficient for ice-covered conditions was found to be approximately 50% smaller than the corresponding coefficient for open water conditions. Since ice cover reduces the product of friction velocity and hydraulic radius by a factor of approximately 2.83 if depth remains constant, these results indicated that ice cover can substantially reduce the mixing capacity of a river. The importance of depth and width variations in the computation of mixing coefficients was discussed and demonstrated. Bend-induced spiral motions appeared to delay vertical mixing until transverse mixing was completed. (Adams-ISWS)
W74-12293

ON THE SYNTHESIS OF RANDOM FIELD SAMPLING FROM THE SPECTRUM: AN APPLICATION TO THE GENERATION OF HYDROLOGIC SPATIAL PROCESSES,

Instituto Venezolano de Investigaciones Cientificas, Caracas. For primary bibliographic entry see Field 2B. W74-12295

ADJUSTMENT OF RIVER CHANNEL CAPACI-TY DOWNSTREAM FROM A RESERVOIR, Exeter Univ. (England). Dept. of Geograph For primary bibliographic entry see Field 4A.

THE KERNEL FUNCTION OF LINEAR NONS-TATIONARY SURFACE RUNOFF SYSTEMS, Technion - Israel Inst. of Tech., Haifa. Faculty of

Civil Engineering.
M. H. Diskin, and A. Boneh.

Water Resources Research, Voi 10, No 4, p 753-761, August 1974. 9 fig, 2 tab, 11 ref.

Descriptors: *Surface runoff, *Hydrographs, *Optimization, *Storms, Base flow, Rainfall-ru-

"Stationary linear model, "Kernel function, Impulse response functions, Discretization scheme, Independent subsets, Natural watersheds, Convolution integral, Cache River at Forman.

Representation of surface runoff systems by a nonstationary linear model gave a closer fit to a set of observed direct surface runoff hydrographs than representation by a stationary linear model. The kernel of this model, which is a function of two time variables, was considered to be an assembly of impulse response functions for unit pulses acting at various time intervals after the beginning of the storm. Each of these impulse

response functions must have the properties of an ordinary instantaneous unit hydrograph. The kernel function was evaluated by an optimization procedure based on a discretization scheme for the functions involved. The set of equations for the unknown kernel values was partitioned into independent subsets, each of which was solved individually. The complete equation set needs consideration only when area constraints of the kernel function are imposed. (Bhowmik-ISWS)

STREAM FLOW CHARACTERISTICS OF: GREENBRIER RIVER SUB-BASIN, West Virginia Dept. of Natural Resources, Char-

leston.

For primary bibliographic entry see Field 7C. W74-12323

A SUBSURFACE RIBBON OF COOL WATER OVER THE CONTINENTAL SHELF OREGON.

Oregon State Univ., Corvallis. School of Oceanog-

A. Huver, and R. L. Smith.

Journal of Physical Oceanography, Vol 4, No 3, p 381-391, July 1974. 9 fig, 1 tab, 29 ref. NSF Grants GX-28746 and GX-33502.

Descriptors: *Oregon, *Continental helf, *Ocean currents, *Surveys, Oceans, Oceanography, Pacific Ocean, Upwelling, Hydrography, Explora-tion, On-site data collections, Temperature, Salinity, Evaluation.
Identifiers: Coastal upwelling experiment.

Observations of the hydrographic regime over the continental shelf off Oregon from the R/V Yaquina during the summer of 1972 showed the presence of an alongshore, subsurface ribbon of relatively cool water. Its properties and its evolution during the 1972 season were described. Examination of earlier observations showed that evidence of the ribbon was found during the upwelling season in almost every year between 1961 and 1971. It was usually observed when the upwelling index (the monthly mean Ekman transport directed offshore) was high. The ribbon can be accounted for by southward advection of subarctic water due to the coastal jet associated with upwelling. A warm temperature anomaly, occurring at somewhat higher salinity, was frequently observed inshore of the ribbon. (Humphreys-ISWS) W74-12324

LAGRANGIAN MEASUREMENTS IN A COASTAL UPWELLING ZONE OFF OREGON, Inter-American Tropical Tuna Commission, La Jolla, Calif.

M. R. Stevenson, R. W. Garvine, and B. Wyatt. Journal of Physical Oceanography, Vol 4, No 3, p 321-336, July 1974. 13 fig, 5 tab, 13 ref. NSF Grant GX-32211.

Descriptors: *Oregon, *Coasts, *Upwelling, *Ocean currents, *On-site investigations, Ocean *Upwelling, circulation, Oceanography, Hydrography, Tem-perature, Salinity, Measurement, Evaluation, Identifiers: *Upwelling circulation, Lagrangian measurements, Coastal upwelling experiment.

During August 1972 drogue and hydrographic measurements were made in the coastal upwelling zone off the Oregon coast. The study was conducted as a component of the Coastal Upwelling Experiment (CUE-1). Both sub-surface parachute drogues and surface vane drogues were tracked for two periods. The one experiment began as the strong prevailing northerlies that drive the summer upwelling began after a cessation of 11 days. A new cycle of upwelling appeared to begin with progressive upwarping of the pycnocline inshore and the generation of strong surface equatorward motion. The other experiment coincided with the abrupt relaxation of strong northerlies and ap-

peared to represent the onset of the decay phase of the upwelling circulation. The pycnocline broke the sea surface about 5 km from shore creating a highly convergent front which drew in the surface vane drogues. A strong sub-surface temperature inversion appeared to be related to intense sinking of surface water at the front. The onshore motion of drogues at 50 m depth gave evidence of per-sistent upwelling, despite the wind relaxation. A conceptual model of the two phases of upwelling circulation observed was presented. (Humphreys-(SWS) W74-12325

THEORETICAL JUSTIFICATION OF PEARSON DISTRIBUTION CURVES, For primary bibliographic entry see Field 2A.

THE POTENTIAL OF METEOROLOGICAL SATELLITE CLOUD OBSERVATIONS FOR DELINEATION OF SIGNIFICANT FEATURES OF COASTAL UPWELLING OFF OREGON, Earth Satellite Corp., Washington, D.C. For primary bibliographic entry see Field 7B.

APPLICATION HYDROLOGIC AND HYDRAU-LIC RESEARCH TO CULVERT SELECTION IN MONTANA, VOLUME 1, REPORT, Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics. For primary bibliographic entry see Field 8A. W74-12340

THE BOSPORUS,

Stanford Research Inst., Irvine, Calif. For primary bibliographic entry see Field 2L. W74-12372

EXPEDITION 'ODYSSEUS 65': RADIOCARBON AGE OF BLACK SEA DEEP WATER, Rosenstiel School of Marine and Atmospheric

Science Miami Fla.

In: The Black Sea-Geology, Chemistry, and Biology; Degens, E.T., and Ross, D.A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 127-132, 1974. 3 fig. 2 tab, 12 ref. NSF Grant GP-4783.

Descriptors: *Water circulation, *Sea water, *Radioactive dating, Carbon radioisotopes, Cur-rents(Water), Advection, Stratification, Ther-mocline, Dissolved oxygen, Density stratification. Identifiers: *Black Sea.

Radiocarbon data from the deep water of the Black Sea indicate a mean residence time of the water of 935 years. It is proposed that about half of the inflow from the Mediterranean is advected to the surface and only half of it participates in forming the deep water. Bottom waters are 2,000 plus or minus 200 years old. (Knapp-USGS)

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1972 - NOVEMBER 30, 1973. Office of Delaware River Master, Milford, Pa. For primary bibliographic entry see Field 4A. W74-12634

CALCULATION OF WATER TEMPERATURE

Moncton Univ. (New Brunswick). Dept. of Engineering. For primary bibliographic entry see Field 7B. W74-12707

2F. Groundwater

HYDROLOGIC CONSEQUENCES OF USING GROUNDWATER TO MAINTAIN LAKE LEVELS AFFECTED BY WATER WELLS NEAR TAMPA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.

W74-12013

DEVELOPMENT OF WATER FROM FRAC-TURED CRYSTALLINE ROCKS, REPUBLIC OF KOREA,

Ministry of Construction, Seoul (Republic of For primary bibliographic entry see Field 4B. W74-12018 Korea).

GROUNDWATER RESOURCES OF THE HOL-LYWOOD AREA, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 4B. W74-12054

GROUNDWATER RESOURCES OF YELLOW CREEK STATE INLAND PORT AREA, TISHOMINGO COUNTY, MISSISSIPPI, Geological Survey, Jackson, Miss. For primary bibliographic entry see Field 4B. W74-12059

HYDROGEOLOGIC DATA FROM GREELEY, WICHITA, SCOTT AND LANE COUNTIES,

Geological Survey, Garden City, Kan. For primary bibliographic entry see Field 4B. W74-12068

THE SHALLOW FRESH-WATER SYSTEM OF THE SHALLOW FRESH-WATER SYSTEM OF SANIBEL ISLAND, LEE COUNTY, FLORIDA, WITH EMPHASIS ON THE SOURCES AND EF-FECTS OF SALINE WATER,

Geological Survey, Tallahassee, Fla.

Florida Bureau of Geology, Tallahassee Report of Investigation No 69, 1974. 52 p., 23 fig., 2 tab, 3 ref.

Descriptors: *Surface-groundwater relationships, *Hydrogeology, *Florida, *Saline water intrusion, Water resources, Water quality, Hydrologic data, Data collections, Artesian aquifers. Identifiers: *Sanibel Island(Fla).

The freshwater system of Sanibel Island, Florida, includes the water-table aquifer and the hydraulically connected surface network of streams, ponds, lakes, and canals in the interior of the island. Beneath the water-table aquifer, a shallow artesian aquifer occurs at depths ranging from about 29 to 34 feet below land surface and probably extends to depths of more than 100 feet.
Within the shallow artesian aquifer, water levels
respond to the loading and unloading of tides in the respond to the loading and unloading or uses in use Gulf of Mexico. The tidal efficiency of wells tapping this aquifer range from about 10% to 77%. Chloride concentrations in the water-table aquifer range from 12 to 23,200 milligrams per liter; considerable to the salt. range from 12 to 23,200 milligrams per liter; con-centrations are highest in or adjacent to the salt-marsh areas along the north half of the island. Within the shallow artesian aquifer, the chloride concentrations range from 2,250 to 30,900 mg/liter; concentrations are highest under the north half of the island. Most of the problems caused by intrusion of saline water into the interior freshwater system can be resolved. The inland movement of saline water through the Sanibel River from adjacent tidal water bodies could largely be averted if the control structures were modified to prevent being topped by high tides. Dewatering of excavations should be restricted to those areas where no freshwater occurs within the water-table aquifer. Excavations should be limited

Group 2F-Groundwater

to depths which will not improve the hydraulic connection between the water-table and shallow artesian aquifers. All wells or test holes which penetrate any of the artesian aquifers should be penetrate any of the artesian aquiters should be plugged with cement after serving their purpose. (Knapp-USGS)
W74-12071

HYDRODYNAMICS OF ARTIFICIAL GROUND-

WATER RECHARGE, California Univ., Irvine. School of Engineering. For primary bibliographic entry see Field 4B. W74-12195

TRACING SHALLOW GROUNDWATER SYSTEMS BY SOIL TEMPERATURES. Illinois State Geological Survey, Urbana. K. Cartwright.

Water Resources Research, Vol 10, No 4, p 847-855, August 1974. 9 fig, 23 ref.

Descriptors: *Illinois, *Groundwater movement, *Soil temperature, *Heat flow, Dishcarge(Water), Son temperature, "hear now, Disnearget Water), Recharge, Aquifer characteristics, Glacial aquifers, Flow system. Identifiers: "Temperature profiles, Temperature surveying, Heat modeling.

Circulating water is known to affect the tempera-ture of the rock through which it flows. Analysis of existing theoretical equations suggests that shallow groundwater flow will also affect the surface soil temperature. Soil temperatures therefore might be used to delineate small, shallow ground-water flow systems; both recharge and discharge zones might be distinguished. Temperature data taken in the field during summer and winter sup-port these theoretical conclusions and agree with the groundwater flow patterns inferred from hydrologic data. In general, winter soil temperature profiles have less data scatter than profiles of summer temperatures. The greater the rate of groundwater flow, the greater the temperature difference between recharge and discharge zones. Temperature variations ranged from 0.75C in clayey glacial till to 5C in sand. The effect on soil temperature also decreases with increasing horizontal distance between the recharge and the discharge zone. The effect of horizontal flow in a shallow confined aquifer is also predictable from theoretical models and can be shown by field studies. The amount of heat redistributed depends on the thermal properties of the aquifer and on over-burden and the velocity of fluid flow. (Gigg-ISWS)

IDENTIFICATION OF PARAMETERS IN AN INHOMOGENEOUS AQUIFER BY USE OF THE MAXIMUM PRINCIPLE OF OPTIMAL CONTROL AND OUASI-LINEARIZATION.

California Univ., Los Angeles. Dept. of Systems

Engineering. A. C. Lin, and W. W-G. Yeh.

Water Resources Research, Vol 10, No 4, p 829-838, August 1974. 3 fig, 3 tab, 13 ref, 1 append. UCAL-WRC-W-290.

Descriptors: *Aquifer characteristics, *Diffusivity, *Optimization, *Linear programming, *Least squares method, Mathematical studies, Parametric hydrology, Mathematics, Ob-servation wells, Wells, Groundwater, Computer models, Aquifers.

Identifiers: *Inverse problem, *Maximum principle optimization, Quasi-Linerization, Parameter identification, Finite differences, Unconfined aquifer, Numerical example.

Optimal identification of aquifer parameters in a distributed system was formulated as an optimal control problem. The dynamics of the head was governed by a second-order nonlinear partial dif-ferential equation. The numerical example presented considers that the parameters to be identified were functions of the space variable. Observations on head variations were available at several observation wells distributed within the system. Spatial discretization was first used to transform the distributed system to a lumped system. The least squares criterion function was then established. After introducing the Lagrange multipliers, the maximum principle was applied to obtain the set of necessary conditions that is optimal. These conditions were expressed in terms of a set of canonic equations of two-point boundary value type that is easily solved by the technique of quasi-linearization. Thus aquifer parameters were directly identified on the basis of observational data taken at observation stations. The maximum principle formulation is inherently more accurate and stable, since it minimizes the least squares error over the whole time and space domains. Computationally, it is extremely efficient. The nu-Computationally, it is extremely efficient. The nu-merical example presented demonstrates simul-taneous identification of 11 parameters defined at discretized points along the space variable. Quadratic convergence was also demonstrated by numerical experimentation. (Prickett-ISWS) W74-12308

DATA FROM CONTROLLED DRILLING PROGRAM IN LEE AND OGLE COUNTIES, IL-LINOIS

Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 4B. W74-12317

GHANATS OF IRAN: DRAINAGE OF SLOPING AQUIFER,

Iranian Plan and Budget Organization, Tehran. Technical Bureau. For primary bibliographic entry see Field 4B. W74-12318

COLUMN SCANNING WITH SIMULTANEOUS USE OF 241AM AND 137CS GAMMA RADIA-

Agricultural Univ., Wageningen (Netherlands). For primary bibliographic entry see Field 2G. W74-12319

PIPE FLOW MODELS OF A KENTUCKY LIMESTONE AQUIFER,

Kentucky Univ., Lexington. Dept. of Geology. J. Thrailkill.

Groundwater, Vol 12, No 4, p 202-205, July-August 1974. 3 fig, 1 tab, 12 ref.

Descriptors: *Groundwater movement, *Computer models, *Aquifers, *Surface groundwater relationships, *Limestones, Hydrologic properties, Darcys Law, Transmissivity, Carbonate rocks, Water table, Springs, *Kentucky. Identifiers: Sinkhole Plain(Ky), Green River(Ky), Little Barren River(Ky), Pipe network model, Groundwater modeling, Barren River(Ky).

A digital computer program which simulates a A digital computer program which simulates a limestone aquifer as a pipe network was written and compared with the Sinkhole Plain aquifer of west-central Kentucky. Model 1, which considers the flow in the network to be laminar, yielded values of head, flow in the network, and discharge at the bounding streams which are in reasonably good agreement with field observations. The overall hydraulic conductivity of the aquifer appears to be about 5600 meinzers if the zone of active flow is 30 meters thick, but the northeastern portion of the aquifer probably has a higher transmissivity. The indicated location of the principal ground-water divide agrees well with data derived from wells and from tracing undergroundwater flows. A second model (Model 2) was constructed which considers flow in the network to be turbulent. Although this model yields values which differ from Model 1, the differences are too small to allow the mode of flow in the aquifer to be distin-guished using observational data. (Sanderson-ISWS)

NATURAL LONG-PERIOD GROUNDWATER LEVEL FLUCTUATION,

V. S. Kovalevskiv.

Soviet Hydrology: Selected Papers, No 1, p 38-50, 1973. 10 fig, 1 tab, 18 ref. Translated from Vodnyye Resursy, No 1, p 161-177, 1973.

Descriptors: *Water level fluctuations, table, *Hydrogeology, *Forecasting, Variability, Groundwater resources, Groundwater, Hydrology, Projections, Frequency. Identifiers: *USSR.

The periodicity patterns examined led to the conclusion that there is a considerable regional irregularity in the natural groundwater recharge over a long period. This must unavoidably be reflected in long period. This must unavoidably be reflected in river recharge and in the general hydrologic budget of the USSR. The inertia of groundwater runoff results in the redistribution of variations in groundwater recharge with time. Groundwater plays a definite regulating role in the general hydrologic cycle of the earth. Yet, the periodicity of groundwaters shows that they are an inseparable part of the hydrosphere of the earth whose regime must be analyzed by unified methods and as a whole. Observed groundwater level fluctua-tions for selected wells and curves of the groundwater levels forecast for individual regions of the USSR were presented. (Humphreys-ISWS) W74-12327

METHOD FOR COMPUTING NORMAL GROUNDWATER DISCHARGE INTO SMALL

RIVERS, B. M. Dobroumov.

Soviet Hydrology: Selected Papers, No 1, p 66-70, 1973. 3 fig, 2 tab, 3 ref. Translated from GGI, Sbornik rabot po gidrologii, No 10, p 89-96, 1970.

Descriptors: *Base flow, *Surface-groundwater relationships, *Groundwater basins, *River flow, Groundwater, Subsurface waters, Regions, Discharge(Water), Groundwater resources, Drainage area, Watersheds(Basin), Hydrologic Drainage area, Watersheds(Basin), Hydrologic equation, Hydrology.
Identifiers: *USSR(Central Chernozem Regions), Small rivers.

Groundwater inflow to rivers was determined by separating total river runoff hydrographs into surface and subsurface components. Hydrogeological regionalization of the Central Chernozem Regions and determination of long-period mean groundwater inflow rotes in the product of the control of t water inflow rates to rivers made it possible to construct curves of the groundwater discharge rate as a function of river basin area for each region. Maps of hydroisohypses showed that the surgion. Maps of nydroisonypses showed that the sur-face and subsurface drainage basins coincide over most of the region under study. The largest drainage areas reported for which a river can be regarded as small were determined from these curves. Annual values of groundwater inflow rate to small rivers was reported equal to a times the river basin F raised to the n power, where a and n are regional parameters. Reported values for a varied from 0.000008 to 0.00085 and from 1.02 to 1.49 for n. Relationship was not recommended for river basin areas less than 100 sq km. (Humphreys-ISWS) W74-12331

INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLICATIONS 2. ERROR ANALYSIS OF APPROXI-

MATE THEORIES, Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Investigacion en Matematicas Aplicadas y Sistemas. І. Неггега.

Water Resources Research, Vol 10, No 4, p 811-820, August 1974. 2 fig, 1 tab, 17 ref, 1 append.

Descriptors: *Aquitards, Drawdown, Storage capacity, Permeability. Identifiers: *Confined aquifer, *Vertical flow, *Leaky aquifer systems, *Error analysis.

This paper is the second of a series devoted to developing a method of analysis based on the in-tegrodifferential equations of leaky aquifer systems. In part 1 (Herrera and Rodarte, 1973a) (W73-13378) the integrodifferential equations were derived, and an interpretation for some of the approximate theories was given in terms of the memory functions occurring in the equations. The same equations are quite suitable for a systematic analysis of the errors involved, and therefore in this paper they are used to carry it out. (Schicht-ISWS) W74-12333

GEOHYDROLOGY OF THE PARKER-BLYTHE-CIBOLA AREA, ARIZONA AND CALIFORNIA,

CIBULA AREA, ARIZUNA AND CALIFORNIA, Geological Survey, Washington, D.C. D.G. Metzger, O. J. Loeltz, and B. Irelan. Available from Sup Doc GPO, Washington, DC 20402, Price \$5.00. Professional Paper 486-G, 1973. 130 p, 37 fig, 6 plate, 14 tab, 53 ref.

Descriptors: *Water resources, *Arizona, *California, *Groundwater, *Hydrogeology, Alluvium, Surface-groundwater relationships, Colorado River basin, Irrigation water, Hydrologic data, Water yield, Transmissivity.
Identifiers: Parker-Blythe-Cibola area(Calif-Ariz).

An investigation of the groundwater resources of the Parker-Blythe-Cibola area, Arizona and California, began in 1960 as a part of the Lower Colorado River Project (LCRP). The area extends from Davis Dam south along the valleys of the Colorado River to the international boundary and to Coachella and Imperial Valleys. The geologic units that are important in water resources are the Miocene fanglomerate, the Bouse Formation, and the alluvium of the Colorado River and its tributaries. The fanglomerate is a potentially important aquifer. Throughout most of the area, wells in the Bouse Formation will yield very limited quantities of water. Most of the wells in the area yield water from the Colorado River alluvium. Wells that tap a sufficient thickness of these gravels have specific capacities larger than 100 gpm per foot of drawwn. The Colorado River recharges the aquifers both directly and indirectly by infiltration of irriga-tion water. The pattern of water-level fluctuations is a combination of the effects of changes in river stages, irrigation, and consumptive use. Rarely does the resultant effect exceed 3 feet. Transmissivities range from less than 100 to a high of 700,000 gallons per day per foot. Except where the water has been freshened as a result of irrigation, much of the shallow groundwater is of relatively poor quality. Water in the river and in the alluvium generally contains between 650 and 800 milligrams per liter dissolved solids; sulfate is the predomi-nant constituent. (Knapp-USGS) W74-12339

INDUCED INFILTRATION AT THE UNIVERSI-TY OF CONNECTICUT WELL FIELD,

Connecticut Univ., Storrs. For primary bibliographic entry see Field 4B. W74-12529

TIDAL FLUCTUATIONS OF WATER LEVELS IN WELLS IN CRYSTALLINE ROCKS IN NORTH GEORGIA,

J. W. Stewart. Geological Survey Research, Article 46, 1961. p B-107-B-109, 1 fig, 1 ref.

Descriptors: *Groundwater, Water wells, *Crystalline rocks, Tides, Diurnal, Metamorphic rocks, Saprolites, Beds(Stratigraphic), Folds(Geologic), Permeability, Weathering, Clays, Silts, Cracks, Confined water schists, Hydrology, *Georgia, *Tidal effects, *Water level fluctuations fluctuations. Identifiers: Lunar cycle.

The semidiurnal water-level fluctuations of a tidal period were observed in wells in metamorphic crystalline rocks during a geologic and hydrologic study at the Georgia Nuclear Laboratory in Dawson County, Ga. The following evidence in-dicates that the semidiurnal fluctuations of water levels are the result of earth tides produced by the attraction of the moon and sun: (1) two daily cycles of water-level fluctuations occur in the wells, about 50 minutes later each day; (2) the close agreement of the average daily retardation of the peaks and troughs in the wells with that of the average daily retardation of the moon's transit; (3) the occurrence of regular fluctuations of maximum amplitudes during periods of new and full moon and irregular fluctuations of minimum amplitudes during periods of the first and last quar ters of the moon; and (4) the coincidence of the lowest water levels in wells with that of the moon's transit at upper and lower culmination. (Campbell-NWWA) W74-12551

DISPOSAL OF URANIUM-MILL EFFLUENT NEAR GRANTS, NEW MEXICO, For primary bibliographic entry see Field 5E. W74-12552

HYDROLOGICAL REGIME OF LOWER DNIEPER SANDS IN CONNECTION WITH THEIR AFFORESTATION, (IN RUSSIAN), V. N. Vinogradov.

Dokl Vses Ord Lenina Akad S-Kh Nauk Im V I Lenina. 2, p 37-40, 1973. Illus. Identifiers: Fluctuations, *Reforestation, Percola-

tion, Sands, *USSR(Dnieper River).

Massive pine plantings affect the hydrological regime just as herbaceous vegetation of over-grown areas. Afforestation of the latter does not introduce marked changes into the total regime of groundwaters. The groundwaters of the nearwater sands of the region belong to the desorptive-corrective type which undergo spring-summer-fall desorptive lowering and fall-winter-spring percola-tion corrective rise. A special feature is the presence of a winter corrective rise due to mild winters and prolonged thaws.--Copyright 1973, Biological Abstracts, Inc. W74-12555

MAP SHOWING DEPTH TO BEDROCK, HART-FORD SOUTH QUADRANGLE, CONNEC-TICUT,

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W74-12627

CONTOUR MAP OF THE BEDROCK SUR-FACE, TARIFFVILLE QUADRANGLE, CON-NECTICUT-MASSACHUSETTS, Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W74-12628

MAP SHOWING DEPTH TO BEDROCK, OLD LYME QUADRANGLE, CONNECTICUT, Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W74-12629

CONTOUR MAP OF THE BEDROCK SURFACE, GLASTONBURY QUADRANGLE, CONNECTICUT,

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W74-12630

CONTOUR MAP OF THE BEDROCK SURFACE, ELLINGTON QUADRANGLE, CONNEC-Geological Survey, Hartford, Conn.

For primary bibliographic entry see Field 7C. W74-12631

MAP SHOWING AVAILABILITY OF GROUND-WATER, WARREN QUADRANGLE, MAS-SACHUSETTS,

Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C. W74-12632

A GROUNDWATER INVESTIGATION OF THE LUMMI INDIAN RESERVATION, WASHING-

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 4B. W74-12635

APPRAISAL OF OPERATING EFFICIENCY OF RECHARGE BASINS ON LONG ISLAND, NEW YORK. IN 1969.

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4B.

2G. Water In Soils

HIGH-RATE LAND TREATMENT I: INFILTRA-TION AND HYDRAULIC ASPECTS OF THE FLUSHING MEADOWS PROJECT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 5D. W74-12004

CENTRIFUGATION: APPLIED ASPECTS IN ELUCIDATING CHEMICAL AND BIOLOGICAL FORMS, DISTRIBUTION AND AVAILABILITY OF HEAVY METALS IN THE

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5D. W74-12026

THE ANSWER OF THE SOIL GENETIC CRITERIA TO THE OUESTION OF THE FUNC-TION AND DURABILITY OF AMELIORATING SUB-SOILING OF PSEUDOGLEY, Institut National de la Recherche Agronomique,

Tunis (Tunisia).

E. Kopp. Z Kukturtech Flurbereinig. Vol 13, No 5, p 272-278, 1972. (English summary). Identifiers: *Pseudogley, *Soil surveys. *Subsoiling, *Tillage.

Comparative soil surveys, cartography, physical measurements of different old drainage ditches and archeological layouts showed that under certain conditions, a constant mellowing can be reached. Condensations are soil-physically favorable structures, a product of certain age and of specific soil dynamic processes. Subsoiling or deep tillage are actions which artificially influence the buffer system of the soil. Effects of unchangeable but fossil processes are neutralized and adapted to actual conditions of soil structure. Adequate deep tillage and accessory actions will transform soils which are not adapted to modern environmental conditions, and for centuries, these soils will regain unfavorable physical condition.--Copyright 1973, Biological Abstracts, Inc. W74-1215

PRIMARY CHECKING OF DATA MOISTURE RESERVES IN SOIL WITH ELEC-TRONIC COMPUTERS, (IN RUSSIAN),

Tr Inst Eksp Meteorol Gl Upr Gidrometeorol Sluzhby Pri Sov Minist SSSR. 13, p 57-65, 1970.

Group 2G-Water In Soils

*Soil Computers, moisture. Identifiers: *USSR(Belorussia), Crops, Soil horizons, *Data collections.

The paired coefficients of correlation (r) between moisture reserves under winter crops in different soil horizons were calculated on the basis of a large volume of information on the reserves of available moisture in different soils of the Belorussian SSR. The correlation between the moisture reserves in the individual 10 cm horizons is clearly traced in the upper 60-cm layer. The moisture reserves in the 50-60-cm layer are well correlated with the moisture in the 90-100 cm layer (r=0.69). The correlation between the moisture reserves in The correlation between the moisture reserves in the 10-cm soil layers was used to construct statistical schemes of the primary check in the form of the control W(j-1)-j=EWj(j-2)-(j-1)+Cj, where W (j-1)-j is the estimate of moisture reserves in the soil layers 10-20, 20-30,...,90-100 cm -W(j-2)-(j-1), represents the actual moisture reserves of the soil in the layers 0-10, 10-20,..., 80-90 cm; Ej, coefficient of regression; Cj, free term of the equation. It is possible to use computers for checking if errors exceeding certain permissible limits have been detected.--Copyright 1973, Biological Ab-W74-12159

CONTRIBUTIONS TO THE KNOWLEDGE OF TISSA PLAIN PSEUDOGLEY SOILS, (IN RU-

MANIAN), Institutul de Studii si Cercetari Pedologie, Bucharest (Rumania).

I. Munteanu, G. Babos, P. Vasilescu, A. Conescu, and M. Munteanu.

Annales Inst Stud Cercet Pedol. 39, p 259-279.

1971. Illus. English summary. Identifiers: Albaqualf, Pedogenesis, Plains, Planosol, *Pseudogley soil, *Romania(Tissa plain), Soils, *Soil types, *Soil classification.

Pseudogley soils of the Tissa plain (Romania) develop in the oak forest zone in areas having a flat or slightly inclined position (terraces or piedmont, slightly dissected plains), covered with fine deposits with over 45% of the fractions less than 0.002 mm. Average annual temperature ranges between 10.3 deg - 10.9 deg, while the average annual rainfall ranges between 600-760 mm, important seasonal, contrasting moisture values are frequently noted. In connection with fine texture of parental material (and probably with the climate), the argilluviation process is accompanied by the appearance of features characteristic to plansols, i.e.: an upper, strongly bleached and clay-impoverished horizon, an abrupt change of clay-impoverished horizon, an abrupt change of texture and a Bt horizon strongly enriched in fine fractions. Two groups of pseudogley soils may be noted as a function of argilluviation intensity: slightly and moderately 'lessive' pseudogley and 'lessive' pseudogley soils. Soils possessing a texture differentiation index of 1.7-1.9, a moderate debasification (V = 53-74%) and a moderately-weak acid reaction (pH = 5.4-6.1) are included in the first group. The second group includes soils the first group. The second group includes soils with texture differentiation indexes exceeding .5(2.5-3.2), dominantly oligomesobasic (V 56% or even 30%) and possessing a moderately-strong acid reaction (pH = 5.0-5.7). Variation of free iron/total iron and free iron/clay (less than 0.002 mm) ratios in the soil profile evidences a relative accumulation of the free-iron in the upper horizon -- a specific feature of these soils. Chemical analysis of clay fraction less than 0.01 mm shows an increase in the ratio SiO2/R2O3 from 2.7 in the elluvial horizon, to 3.04 in the illuvial one. The Tissa plain pseudogley soils may be regarded as hydromorphic clay -- illuvial soils (Stagnohydromorphic). The main part of pseudogley soils are classified, according to FAO classification, as planosols (entric and dystric-entric), while in the American classification, these soils are found under Albaqualf soils (mostly typical and some vertic).--Copyright 1974, Biological Abstracts, Inc. W74-12282

WATERPROOFING SURFACE-ZONE SOIL AG-GREGATES FOR WATER CONSERVATION, Hebrew Univ., Rehovot (Israel). Faculty Agriculture.
D. Hillel, and P. Berliner.

Soil Science, Vol 118, No 2, p 131-135, August 1974. 3 fig, 12 ref.

Descriptors: *Soil sealants, *Laboratory tests, *Water conservation, *Soil profiles, Water conservation, Soil profiles, Waterproofing, Coatings, Soil analysis, Hydraulic models, Evaporation control, Water resources, Soil tests, Soil management, Infiltration, Soil moisture, Soil treatment, Retention, Soil profiles, Percolation. Identifiers: *Israel(Malkia-Upper Galilee), Terra-

rossa clay loam.

Layers of silicone-treated soil aggregates of various depths and size classes were tested in labora-tory columns to determine their effect upon the processes of water intake and evaporation. The results showed that the presence of a top layer of hydrophobic aggregates can either decrease or crease infiltrability, depending on the sizes of the aggregates, which determine the effective diameters of the interaggregate voids. If the aggregates are sufficiently large, a top layer of hydrophobic aggregates can readily transmit water downwards even while the aggregates themselves remain dry. A secondary consequence of this effect is the prevention of slaking or crust formation, which often inhibits infiltration. The presence of a toplaver of hydrophobic aggregates had a marked effect in reducing evaporation, the magnitude of this reduction again depending on the sizes of the ag-gregates and the depth of the aggregated layer. Ag-gregate-size classes were 0.2-0.5 mm, 0.5-1 mm, 1.2 mm, 2-5 mm. Waterproofing surface-zone soil aggregates appeared to be a promosing approach to soil water conservation, and must be tested in the field. (Humphreys-ISWS)

THE ROLE OF OXYGEN IN NITROGEN LOSS FROM FLOODED SOILS,

Louisiana State Univ., Baton Rouge. W. H. Patrick, Jr., and S. Gotoh. Soil Science, Vol 118, No 2, p 78-81, August 1974. 3 fig, 1 tab, 5 ref. EPA Project R-800428.

Descriptors: *Soil science, *Laboratory tests, Oxygen requirements, *Nitrification, Soil analysis, Aerobic conditions, Oxygen, Nitrogen, Oxidation, Denitrification, Nitrates, Nitrogen cycle, Soil surfaces, Soil chemistry Identifiers: *Flooded soils, Crowley silt loam soil

The concentration of atmospheric 02 over flooded soil was a factor in determining the amount of N lost by denitrification. Large increases in N loss occurred from the first few incre-ments of oxygen with little further loss occurring above 20 percent 02. The thickness of the aerobic above 20 percent 02. The thickness of the aerobic layer was also governed by the amount of 02 in the air. Nitrogen loss was generally related to the thickness of the aerobic layer, even though appreciable loss occurred at 5 and 10 percent 02 where the aerobic layer was relatively thin. (Humphreys-ISWS) W74-12290

SEEPAGE RATES AND THE HORIZONTAL FLOW APPROXIMATION, Agricultural Research Council, Cambridge (England). Unit of Soil Physics. For primary bibliographic entry see Field 8D.

DETERMINATION OF DISPERSION AND NON-LINEAR ADSORPTION PARAMETERS FOR FLOW IN POROUS MEDIA, Purdue Univ., Lafayette, Ind. School of Chemical

Engineering. S. P. Gupta, and R. A. Greenkorn.

Water Resources Research, Vol 10, No 4, p 839-846, August 1974. 10 fig, 3 tab, 19 ref.

Descriptors: *Dispersion, *Adsorption, *Porous media, Groundwater movement, Permeability,

Identifiers: *Linear equilibrium adsorption, Freundlich equilibrium adsorption, Linear superposition, Breakthrough curves, Reynolds number.

Ottawa washed sand mixed with 0.0-7.5% kaolin clay was used to determine dispersion and nonlinear adsorption parameters during flow through porous media. The ions considered were nitrate for the nonadsorbing species and phosphate for for the nonadsorbing species and phosphate for the adsorbing species. A one-dimensional linear model with a longitudinal dispersion coefficient was used, and the dispersion coefficient was determined by least squares fit. The dispersion coefficients were correlated with dispersivity models based on kinematic viscosity and powers of velocity and Reynolds number. The velocity ex-ponent seemed independent of clay content, whereas the model coefficients increased approximately linearly with clay content. The static adsorption data suggest a Freundlich isotherm. The principle of linear superposition was assumed for dipersion and adsorption to estimate the dynamic parameters. The adsorption parameter for the linear model was approximately linear with clay content. The two adsorption parameters for the nonlinear model were highly correlated and cannot be estimated simultaneously from dynamic measurements alone. The linear model described the movement of phosphate ions adequately for the movement of phosphate ions adequately for the medium considered. However, for a natural system in which clay content is high and phosphate ion concentration is low one would expect better data from the generalized nonlinear model. (Visocky-ISWS) W74-12299

THE HYDROMETER METHOD FOR DETAILED PARTICLE-SIZE ANALYSIS: 1. GRAPHICAL INTERPRETATION OF HYDROMETER READINGS AND TEST OF

METHOD, Agriculture Research Service, Brawley, Calif. Imperial Valley Conservation Research Center. For primary bibliographic entry see Field 2J. W74-12303

EXPERIMENTAL EVALUATION OF CHEMICAL TRANSPORT IN WATER-SATURATED POROUS MEDIA: 1. NONSORBING MEDIA, Oregon State Univ., Corvallis. Dept. of Soil Science.; and Oregon State Univ., Corvallis. Dept. of Assignmentary.

of Agricultural Chemistry.

S. K. Saxena, F. T. Lindstrom, and L. Boersma.
Soil Science, Vol 118, No 2, p 120-126, August
1974, 3 fig, 2 tab, 10 ref. NIEHS Grant ES 00040, USDI Grant B-001-ORE

Descriptors: *Dispersion, *Diffusion, *Sorption, Porous media, Voids.
Identifiers: *2,4-dichlorophenoxyacetic

Identifiers: *2,4-dichlorophenoxyacetic acid, *Chemical transport, Pore radii, Glass beads, Breakthrough curve.

Dispersion profiles of 2,4-dichlorophenoxyacetic acid were measured experimentally to evaluate a theoretical dispersion model previously developed by the investigators and to evaluate the effect of pore size on dispersion. The chemical being dispersed along a column made up of glass beads was initially present only in the pore water of a 1 cm long section at the front of the column. After leaching for a period of time, the column was sec-tioned and the concentration in each section was obtained and compared with a predicted concentration. Four porous media systems consisting of glass beads with particle diameters of less than 30, 28-53, 105-149, and 149-210 millimicrons obtained by dry sieving were used. Corresponding predominant pore radii were 4.5, 8.2, 19.5, and 36.2 millimicrons. The corresponding dispersion coeffi-

cients were found to be 0.53, 0.69, 1.41, and 2.05 sq cuents were found to be 0.35, 0.05, 1.41, and 2.05 sq cm/day, respectively. Using these values, theoreti-cal dispersion profiles were calculated. The theoretical distributions of the chemical in the columns were found to be in good agreement with the experimentally determined distributions. The values of the dispersion coefficients could be related to pore size, diffusion coefficient, and flow rate. (Visocky-ISWS) W74-12306

LATERAL MOVEMENT AT THE PERIPHERY LATERAL MOVEMENT AT THE PERIPHERY
OF A ONE-DIMENSIONAL FLOW OF WATER,
Connecticut Agricultural Experiment Station,
New Haven. Dept. of Ecology and Climatology.
N. C. Turner, and J. Y. Parlange.
Soil Science, Vol 118, No 2, p 70-77, August 1974.

Descriptors: *Soil water movement, *Soil physical properties, *Infiltration, Recharge, Diffusivity, Moisture content.

Identifiers: Double ring infiltrometer.

An approximate analytical solution for the lateral movement at the periphery of a one-dimensional flow of water without gravity was derived for a source that is a semi-infinite plane. The solution was shown to be valid experimentally for relative-ly long times for a source with finite length. The theory can be utilized to calculate, and correct for, the additional infiltration due to lateral movement in measurements of water intake in the field; when gravity was present, however, the correction was valid only for short times. (Schicht-ISWS)

PERSISTENCE AND MOVEMENT OF DBCP IN THREE TYPES OF SOIL,
California Univ., Davis. Dept. of Nematology.

For primary bibliographic entry see Field 5B. W74-12310

TWO-DIMENSIONAL SEEPAGE IN LAYERED SOIL-DESTABILIZING EFFECTS OF FLOWS WITH AN UNSTEADY FREE SURFACE,

State Univ. of New York, Stony Brook.
D. Dicker, and D. K. Babu.
Water Resources Research, Vol 10, No 4, p 801-809, August 1974. 5 fig, 8 ref, 1 append.

Descriptors: *Soil stability, *Seepage, *Unsteady flow, *Free surface, *Landslides, Groundwater, Soil pressure, Soil water, Soil water movement, Soil pressure, Soil water, Soil water, Soil mosture, Soil mosture, Soil investigations, Soil mechanics, Soil properties, Mathematical studies, Mathematical models. Identifiers: "Layered soils, "Perturbation techniques, Soil slope, Prolonged rainfall effects,

Heterogeneous porous media.

An analytic study was made about the destabiliz-ing effects of a prolonged rainfall over the sides of a long symmetric hill. The assumptions underlying a long symmetric nill. The assumptions underlying the analysis were (1) the soil consisted of layers parallel to the hillslope, (2) the flow domain was bounded from below by an unknown free surface, and (3) this free boundary moves downward with passage of time. The resulting flow pattern was therefore time dependent. The motion is described by Darcy's law as applied to a saturated porous medium having variable conductivity. Perturbation techniques were applied in constructing the tion techniques were applied in constructing the tion techniques were applied in constructing in-solution to this nonlinear problem. For certain por-tions of the flow region the perturbation becomes singular, and the singularities were removed by the methods of matched asymptotic expansions. Properties of singular integrals with Cauchy kernels were employed in certain quantitative estimates.

Only the first-order effects are presented here. It was shown that one large-time effect of prolonged rainfall is to generate outward horizontal velocity components in the distant regions of the slope; these components grow in time. It is known in soil mechanics that such tendencies to outward flow

have serious destabilizing effects on the soil slope. This paper demonstrates that the underlying causes for such disasters as landslides can be traced in a significant fashion to the hydrodynamic nature of the seepage that evolves naturally as a result of prolonged rainfall. (Pickett-ISWS) W74-12315

COLUMN SCANNING WITH SIMULTANEOUS USE OF 241AM AND 137CS GAMMA RADIA-

Agricultural Univ., Wageningen (Netherlands). L. Stroosnijder, and J. G. De Swart. Soil Science, Vol 118, No 2, p 61-69, August 1974. 4 fig, 1 tab, 13 ref.

Descriptors: *Soil moisture. *Moisture availabili-Descriptors: "Soil moisture, "Moisture availability, "Groundwater availability, "Radioisotopes, *Analytical techniques, Soil analysis, Instrumentation, Soil tests, Soil water, Moisture content, Hydrologic properties, Radiation, Gamma rays, Radioachemical analysis, Radioactivity techniques,

Identifiers: *Gamma radiation, *Column scanning, 241 Am, 137 Cs, *Automatic scanner, Statistical accuracy, Counting rates, Attenuation coeffi-

A soil column scanner using two sources of gamma radiation (241 Am and 137 Cs) simultaneously was described. Separate amplifer/discriminator systems were used for each source. In order to minimize the 137 Cs influence on the 241 Am detector, a cross-beam layout was chosen. A correction of about 10 counts/second on the 241 Am count rate eliminated any remaining 137 Cs influence. Punch tape output permitted fast data assimilation. Variation in mass attenuation coefficients for soil seriously limited the use of this technique in natural soil columns. Statistical accuracy was poor compared to a single moisture determination. A counting time of at least one minute was preferable. An experiment with a swelling clay soil demonstrated the possibility of simultaneous use of both radioisotopes. results of calibration studies were shown. (Henley-W74-12319

ESTIMATION OF RAINFALL EROSION

Engineering-Science, Inc., Berkeley, Calif. For primary bibliographic entry see Field 2J. W74-12321

EXPLANATION OF THE DAILY PATTERN OF WATER EVAPORATION FROM THE SOIL, For primary bibliographic entry see Field 2D. W74-12330

THE QUANTITY AND MOVEMENT OF NITRATES IN SOIL WATER IN TWO CONNECTICUT SOILS TREATED WITH HIGH AND LOW LEVELS OF INORGANIC NITROGEN

FERTILIZER,
Connecticut Univ., Storrs. Inst. of Water For primary bibliographic entry see Field 5B.

W74-12595

RELATION OF CLIMATE TO LEACHING OF SOLUTES AND POLLUTANTS THROUGH SOILS,

Wisconsin Univ., Madison. Dept. of Soil Science. For primary bibliographic entry see Field 5B. W74-12645

ARGILLIZATION BY DESCENDING ACID AT STEAMBOAT SPRINGS, NEVADA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 2K. W74-12651

CLAY WATER INTERACTIONS--AN EXPERI-MENTAL SPHENOMENA. STUDY OF INTERFACE

Royal Inst. of Tech., Stockholm (Sweden). Nuclear Magnetic Resonance Group. E. Forslind, and A. Jacobsson.

Available from NTIS, Springfield, Va. 22161 as AD-772 042, Price \$3.75 printed copy, \$2.25 microfiche. Royal Institute of Technology Nuclear Magnetic Resonance Group Final Technical Report to US Army European Research Office, London, July 1973. 85 p. 32 fig, 7 tab, 71 ref. USA Contract No DAJA 37-72-C-3894.

Descriptors: *Clay minerals, *Adsorption, *Ion exchange, Kaolinite, *Montmorillonite, Nuclear magnetic resonance, Differential thermal analysis. Identifiers: *Clay-water interactions, Vermiculite,

A study of clay-water interactions by NMR and dielectric experiments compared montmorillonite and hectorite. In particular, the temperature de-pendence of the NMR and dielectric absorption bandwidths pointed to different proton relaxation mechanisms in the two types of clay. In fact, the nature of the discrepancies between the expected and observed system behavior called for a reconsideration, not only of the available data regarding the clay surface properties, but also of the concep-tual framework currently used to explain the swelling and cation exchange mechanisms. Reconsideration of the surface structure problem is based on reevaluation of Fourier syntheses, on water structuring as revealed by recent Raman, NMR and dielectric investigations and a reevalua-tion of data pertaining to swelling and b-axis changes of montmorillonites. New aspects on the adsorbed water density are discussed together with questions regarding ion water interactions in kaolinite, montmorillonite, vermiculite and hectorite. (Knapp-USGS) W74-12654

A STUDY OF BACTERIAL MIGRATION IN IR-

RIGATED SOILS, (IN RUSSIAN), Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). For primary bibliographic entry see Field 5B. W74-12704

EFFECT OF SOIL WATER POTENTIAL ON GROWTH AND YIELD OF SUNFLOWER (HELIANTHUS ANNUUS),

Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation. For primary bibliographic entry see Field 3F.

RECLAMATION AND MAINTENANCE OF FERTILITY OF MAJOR SOILS IN THAILAND,

Thai J Agric Sci. Vol 6, No 2, p 127-143, 1973. Identifiers: *Soil fertility, *Land reclamation, *Saline soils, *Thailand, Land use.

Soils of Thailand are of 3 groups according to physiography: soils of the alluvial plains and the lower terraces, soils of the higher terraces and the low plateaus, soils of the hills and the mountains. The reclamation is done mostly for soils of the 1st group: beach and dune sand, saline soils, acid sulfate soils, low-lying floodplains derived from sandstones, and tin-mine spoils. The soils of 2nd group are well drained, but their low organic matter content seems to cause soils to erode easily and to exert other unfavorable properties in relation to plant growth. Soil conservation practices were demonstrated at various land development centers throughout the country. The soils of the 3rd group are easily subject to severe erosion. A general review of land use and problems associated with it is given for each soil described.--Copyright 1974, Biological Abstracts, Inc. W74-12714

Group 2G-Water In Soils

SOIL MICROORGANISM METABOLISM IN SPRAY IRRIGATION,
North Texas State Univ., Denton.

For primary bibliographic entry see Field 5D.

STUDIES ON THE RELATIONSHIP BETWEEN MISCANTHUS SINENSIS COMMUNITY AND SOIL: IV. RELATIONSHIP BETWEEN HUMUS AND PRODUCTIVITY SINENSIS GRASSLAND. OF MISCANTHUS

KNENSIS GRASSLAND, Kobe Univ. (Japan). Faculty of Agriculture. R. Kayama, N. Yano, and M. Fujimoto. Jap J Ecol. Vol 22, No 5, p 195-204. 1972. Illus. Identifiers: Grassland, *Humus, Magnesium, *Miscanthus-Sinensis, Nitrogen, Potassium, Respiration, Soil moisture

The relationship among the standing crop of plants, the components of humus, seasonal change of soil moisture, amount of inorganic N and soil respiration are discussed. The amount of the minerals such as K and Mg in the fulvic acid of the humus in plots having a high standing crop was more than that of plots having a lower standing crop. The presence of a considerable amount of Al in fulvic acid was shown in the low yield plots. The seasonal variation of the soil moisture in the high yield plot was small. Generally, the soil moisture of the upper layer (0-30 cm) was constantly kept at a high level. On the contrary, the soil moisture of a high level. On the contrary, the soil moisture of the upper layer decreased from July to Oct. in the low yield plots. The plot having a deep humus soil layer and favorable soil moisture content had NH4-N and HO3-N a little more than those of the other plots. These were conditioned to contain water in 60% of the maximum water holding capacity and placed in a thermostat of 30C for 3 wk. Thereafter, quantitative analysis was made on the amount of NH4-N and NO3-N. This amount may be considered as potential available N. The amount of NO3-N was scarce but that of NH4-N MH4-N amount of NO3-N was scarce but that of NH4-N was usually high. There seemed to be a considerable amount of available N in the soil for the vigorous reproduction of microorganisms. (See also W72-00721)--Copyright 1973, Biological Abstracts, Inc. W74-12737

EFFECTS OF COARSE CONSTITUENTS ON DYNAMICS OF WATER IN A SANDY SOIL: II. DYNAMICS OF WATER IN A FINE-EARTH/COARSE CONSTITUENTS SYSTEM: POSITIVE MOISTURE CHANGES, (IN

Institut National de la Recherche Agronomique, Versailles (France). Station d'Agronomie. R. Gras.

Ann Agron (Paris). Vol 23, No 3, p 247-316. 1972.

Illus. (English summary).
Identifiers: *Sandy soils, *Soil moisture, *Permeability.

A pebble-containing soil is a heterogeneous system consisting of two materials, fine earth and pebbles (coarse constituents). The dynamics of water in such a system was investigated experimentally using tubes filled with sandy soil containing coarse constituents of definite geometrical shape. The effects of these tubes on the kinetics of the moist front creeping forward in an initially dry soil under different water supply conditions, i.e., horizontal influx, vertical or horizontal moistening are investigated. Experimental data were evaluated in the simpler instances on the basis of the laws of hydrodynamics. After wetting the system, the effect of the coarse constituents on the conveyance of the water by the system is discussed. All constituents curtail the aggregate permeability of the system. During previous experiments the coarse porous constituents may be moistened by the sand. The variational moisture recorded arises from the nature of the coarse constituents and from the water sucked in by the sandy soil and coarse constituents.—Copyright 1973, Biological W74-12742

2H. Lakes

THE INTERDEPENDENCE OF LAKE ICE AND CLIMATE IN CENTRAL NORTH AMERICA, Wolf Research and Development Corp., River-For primary bibliographic entry see Field 2C. W74-12074

LAKE SUPERIOR INVESTIGATIONS,

Minnesota Dept. of Conservation, St. Paul. Div. of Game and Fish. For primary bibliographic entry see Field 8I. W74-12079

FLOW CHARACTERISTICS OF THE OUTLET CHANNELS OF LAKE WINNIPEG FOR NATU-RAL AND REGULATED CONDITIONS, Manitoba Hydro.

For primary bibliographic entry see Field 8B. W74-12091

COMPUTER INVESTIGATIONS OF WATER MOVEMENTS IN LAKES.

A. H. Taylor. A. H. 1 aylor. In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Con-ference, University of Reading, England, p 209-227, 25-27 September 1973. 6 fig. 3 equ. 23 ref.

Descriptors: *Water circulation, *Lakes, Computers, *Computer models, *Simulation analysis, *Mixing, *Turbulence, Variability, Temperature, Currents(Water), Velocity, Flow, Equations, Currents(Water), Systems analysis.

Turbulent mixing plays a fundamental role in lake ecology. Considered is the use of computers to predict the circulation and mixing in lakes. The circulation, which gives rise to turbulent water movement, may not be clearly defined and may change rapidly with atmospheric conditions. Numerical simulations can elucidate lake currents besides providing forecasts for management purposes. Previous models for calculating fluid flows are discussed. Three-dimensional calculations are becoming possible and provide detailed velocity and temperature fields; presented is one such model having variable turbulence coefficients, suited to the variability of lake circulations. The model is designed to investigate lake water movement on an hourly, or a daily, basis to provide insight into the mechanisms of lake mixing. Equations of the lake model are given, and numerical experiments with homogeneous bodies of water are discussed. (See also W74-12107) (Bell-Cornell) W74-12118

WIND DRIVEN CIRCULATION IN SHALLOW LAKES: A FINITE ELEMENT APPROACH, Water Research Association, Marlow (England).

J. M. Davis.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 63-70, 25-27 September 1973. 3 fig, 19 equ, 3 ref.

Descriptors: *Finite element analysis, *Lakes, *Shallow water, *Circulation, *Winds, Velocity, Lake Erie, Lake beds, Currents(Water), Analytical techniques, Systems analysis.
Identifiers: Wind accelerations, Differential equa-

The finite element method is applied to the problem of wind-driven circulation in shallow lakes. The system is considered to be two dimensional so that vertical accelerations and velocities are ignored under the assumption that they are small compared with horizontal velocities. A

hydrostatic pressure distribution is assumed to exist. The model describes the unsteady circula-tion pattern due to wind stresses at the free surface and includes both bed friction and Coriolis effects. The Galerkin method of weighted residuals is used to formulate a set of matrix equations which are solved using an implicit time integration scheme. The components of wind force represent the forcing functions of the system, and the effect of bed friction and the Earth's rotation are in-cluded through the Chezy friction term and the Coriolis parameter respectively. The methodology is illustrated with an application to Lake Erie. (See also W74-12107) (Bell-Cornell) W74-12138

THE DISTRIBUTION OF THE SUBMERGED MACROPHYTES IN THE REEDLESS ZONE OF THE NEUSIEDLER LAKE, (IN GERMAN), Vienna Univ. (Austria). Limnologische Lehrkan-

zel F. Schiemer, and P. Weisser

Sitzungsber Osterr Akad Wiss Mathnaturwiss Kl. Vol 180, No 1-4, p 87-97, Illus, 1972.

Identifiers: Ceratophyllum-demersum, ceratophylla, *Distribution patterns, *Macrophytes, Myriophyllum-spicatum, Lakes. Naiasmarina, Potamogeton-pectinatus, Reedless zones, Reeds. Soils. Wind. Submerged plants. *Austria(Neusiedler Lake).

Potamogeton pectinatus and Myriophyllum spicatum form a broad band of plants in front of reeds. Their distributional pattern is dependent on wind and soil conditions. Soft silt deposits in combination with low turbulence are favorable conditions. The diminished growth along the eastern shore and toward the open sea are proof that waves and a solid or coarsely structured substrate have a negative effect on their growth. P. pectriatus is found in variable densities and crop configurations all over the sea surface and is more abundant within the reed belt than M. spicatum, but takes up a lesser areal portion than the latter. The density of P. pectinatus has decreased due to the increase in depth from 102 cm in 1958 to 165 cm in 1970. Ceratophyllum demersum, Chara ceratophylla and Najas marina are other sub-merged plants found in the area.--Copyright 1974, Biological Abstracts, Inc. W74-12150

ECOLOGY OF THE EULITTORAL ZONE OF

LAKES, Warsaw Univ. (Poland). Zoological Inst. For primary bibliographic entry see Field 5C. W74-12151

SPATIAL AND TIME CHANGES OF SOME EN-VIRONMENTAL FACTORS IN THE PELAGIAL OF MIKOLAJSKIE LAKE,

Polish Academy of Sciences, Warsaw. Inst. of

Polish Academy of Schools Academ

The changes in time and differentiation within the pelagial of Mikolajskie Lake (Masurian Lakeland, Poland) of some environmental factors were measured. The following were analysed: visibility, temperature, oxygen, pH, Fe, Mg, Ca, phosphate, K, Na, N and conductivity.—Copyright 1974, Piological Abstracts. Biological Abstracts, Inc. W74-12155

SEASONAL AND ANNUAL PHYTOPLANKTON CHANGES IN CHIVVRKUISKII BAY, LAKE BAIKAL, (IN RUSSIAN), Limnologicheskii Institut, Irkutsk (USSR).

For primary bibliographic entry see Field 5C.

W74-12160

HYDROLOGICAL AND PHYSICOCHEMICAL CHARACTERISTICS OF THE FISH PONDS OF SOUTHERN TADZHIK SSR, (IN RUSSIAN),

Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.

N. I. Bogdanov, and G. I. Bogdanova. Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 2. p 69-

72, Illus, 1973. 72, Itus, 1973.
Identifiers: Canals, *Carp, Fertilizer, *Fish ponds, Grass carp, Hydrochemical studies, Percolation, Physicochemical studies, Temperature, Physicochemical studies, *USSR(Southern Todzhik SSR).

An investigation of the ponds of the 'Chubek' fishery, located along the former bed of the Afgan-Darya River in southern Tadzhikistan, USSR, showed that the natural and climatic conditions of the location of the ponds are favorable for raising pond fish (carp and grass carp). The temperature regime of the fish ponds is characterized by early warming of the water and comparatively late cooling. The hydrochemical regime of the ponds is favorable. The application of fertilizer to the pond did not have a noticeable adverse effect on the gas regime of the water. Water exchange in the ponds occurs rather intensely owing to percolation of water through the bed and embankments of the ponds. The ponds, which are supplied by a system of canals, accumulate a large quantity of suspended mineral substances, which leads to a reduction of their useful volume and area.—Copyright 1974, Biological Abstracts, Inc. W74-12166

MICRORIOLOGICAL OXIDATION OF MICROBIOLOGICAL OXIDATION OF HYDROGEN SULFIDE IN THE REPNOE LAKE (SLAVONIC LAKES), (IN RUSSIAN), Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.

For primary bibliographic entry see Field 5C. W74-12168

FIRST ANNUAL REPORTS OF THE EPA IFYGL

PROJECTS.
National Environmental Research Center, Grosse Ile, Mich. Grosse Ile Lab. For primary bibliographic entry see Field 5C. W74-12214

NUTRITION PHYTOPLANKTON PHOTOSYNTHESIS IN LAKE MINNETONKA AND LAKES AT FAIRMONT, MINNESOTA,

Minnesota Univ., Minneapolis. Dept. of Ecology and Behavioral Biology. For primary bibliographic entry see Field 5C. W74-12227

DISTRIBUTION OF CYCLOPOIDA COPEPODITES IN THE RESTING STAGE IN BOTTOM SEDIMENTS OF ASTATIC RESER-

VOIRS, Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology. M. Wierzbicka.

Pol Arch Hydrobiol. Vol 19, No 4, p 369-376, 1972, Illus.

Identifiers: Acanthocyclops-Bicuspidatus, Acenthocyclops-Gigas, *Astatic reservoirs, *Bottom sediments, Chemical studies, Climatic studies, *Copepodites, *Cyclopida, Cyclops-Fur-cifer, Cyclops-Strenuus, *Distribution(Vertical-horizontal), *Poland(Warsaw region), Reservoirs, Sediments.

Horizontal and vertical distributions of copepodites IV and V in the resting stages of 4 Cyclopoida species (Cyclops strenuus, C. furcifer, Acanthocyclops gigas and A. bicuspidatus) were investigated in bottom sediments of 2 astatic reservoirs deprived of water from the end of June until March. The reservoirs are situated close to each

other among cultivated fields near the Kampinos Forests, about 30 km from Warsaw, Joland, There were significant differences in quantitative species composition between the reservoirs. Moreover, there were significant differences in horizontal distribution of copepodites in the smaller reservoir between July and Aug. There were also differences in vertical distribution: in the smaller reservoir there were more copepodites in the top layer of sediment (0-1 cm) than in the larger one and they only penetrated to 2.5 cm. The following similarities were found: maximal numbers of copepodites were in the 1-2 cm layer in both reservoirs in Aug. and Oct.; at that time specimens did not penetrate deeper than 5 cm; the species common to both reservoirs preferred similar depths. The differences were probably due to: different substrates, the chemistry of the reservoirs, the span of time from the beginning of the resting stage (influencing the vertical distribution) and climatic conditions (influencing the horizontal distribution) .-- Copyright 1974, Biological Abstracts, Inc. W74-12236

CHANGES IN THE FISH SPECIES COMPOSI-TION OF THE GREAT LAKES,

Ontario Ministry of Natural Resources, Maple. Fish and Wildlife Research Branch. For primary bibliographic entry see Field 5C. W74-12264

THE EMISSION OF BIOGENIC HYDROGEN SULFIDE FROM AMAZONIAN FLOODPLAIN

Instituto Nacional de Pesquisas da Amazonia, Manaus (Brazil). For primary bibliographic entry see Field 5B.

UTILIZATION OF FACTORIAL ANALYSIS IN CONNECTION WITH THE STUDY OF GROWTH IN BENTHIC MOLLUSKS OF LAKE

CHAD, (IN FRENCH), C. Leveque, and M. Gaborit.

W74-12284

Cah ORSTOM Ser Hydrobiol. Vol 6 No 1 p 47-66, 1972. Illus. English summary.
Identifiers: Bellamya, Benthic Bellamya, studies

Chad), Cleopatra, Conalysis, *Growth rate, Corbicula, *Factorial analysis, *Growt Melania, *Mollusks, Sediments. Lakes.

After a brief account of basic principles necessary for a right interpretation of the method used, factorial analysis of correspondances was applies to samples taken during 2 missions in the Bol area (1967 and 1970) and 2 missions on the whole lake Chad (1968 and 1970). Individuality of populations for each type of bottom recorded in the Bol area was shown. In the lake as a whole and for the same grographical zone, the nature of the sediments has some influence on the specific composition of populations. Populations of the central part of the lake differ fundamentally from the populations of other biotopes by dominance of Melania and importance of Bellamya in their specific profile. On the other hand Cleopatra are dominant in the eastern part of the lake where Corbicula are also of importance. Presence of intermediate populations between the 2 preceding units, in which the relative importance of Melania and Cleopatra is quite the same, leads to the conclusion that they are 2 vicariantes species, that is one species can be sub-stituted for the other species under particular con-ditions. This phenomenon could be observed in 1970 for populations living on the mud in the Bol area, as well as for some biotopes from the eastern zone of the lake. Apart from this evolution, stability is usually observed within a 2 yr period for the average samples of one biotope. There is no specific affinity between the 7 species studied.—Copyright 1974, Biological Abstracts, Inc. W74-12332 DATA ON SELECTED LAKES IN WASHING-TON, PART II.

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 5A. W74-12341

FEASIBILITY STUDY TO DEVELOP GUIDELINES FOR LAKE AND RELATED LAND RESOURCE USE DEVELOPMENT RESEARCH, OR ECONOMIC AND ECOLOGICAL IMPACT OF VARIOUS FORMS OF LAKE RESOURCE DEVELOPMENT,

New Hampshire Univ., Durham. Water Resource Research Center. R. A. Andrews.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 912, 3.25 in paper copy, \$2.25 in microfiche. Completion Report, (1974). 32 p, 17 ref, 3 append. OWRT A-036-NH(1). 14-31-0001-4029.

Descriptors: *Land use, *Feasibilities studies, *Lake development, *Water resources development, *New Hampshire, New England, Water

Identifiers: *Lake water quality, *Lake resource development, Ecological impact, Lake Winnepesaukee(NH), Squam lakes.

Many New Hampshire lakes are rapidly being developed, mainly for recreational purposes. The vacation cottage or second home is a major, but not the only, kind of development taking place. Concern over type and kind of development began in the late 1960s and early 1970s. This study in-vestigated research approaches to answer numerous questions relating to guiding lake development. An attempt was made to develop an interdisciplinary project to analyze the impacts of alternative futures for lake and related land resources. Officially, New Hampshire does not have polluted lakes. This is solely based on coliform count. Eutrophia and weed problems, however, are nu-merous. Sources of major eutrophia problems are discussed. A wide range of current development found on lakes is discussed and oriented to historical development patterns, access and distance from large population centers. This development has given rise to a sizeable service industry and shopping centers. A number of communities have established good relations with the industries and spend sizeable amounts on providing public ser-vices. A brief review of the literature revealed some mixed results in terms of physical and economic impact on an area. Marinas and septic tanks may have helped maintain the quality of some lakes. W74-12350

BASIC RESEARCH IN THE AQUATIC EN-VIRONMENT: EFFECTS OF EUTROPHICA-TION ON PHYTOPLANKTON AND SELECTED SPECIES OF AQUATIC VASCULAR PLANTS-PHASE II, Cornell Univ., Ithaca, N.Y. Dept. of Ecology and

Systematics For primary bibliographic entry see Field 5C. W74-12365

WATER QUALITY IMPROVEMENT OF STRATIFIED IMPOUNDMENTS BY SELEC-TIVE WITHDRAWAL OF BOTTOM WATERS, Wisconsin Univ., Madison. Dept. of Civil and En-For primary bibliographic entry see Field 5G. W74-12370

SPATIAL AND SEASONAL VARIATIONS OF THE MESOPLEUSTON OF THE YALCA POND PROVINCE OF BUENOS AIRES, ARGENTINA), (IN SPANISH),
La Plata Univ. (Argentina). Instituto de Lim-

nologia. J. A. Schnack.

Group 2H-Lakes

Physis Secc B Aguas Cont Org. Vol 32, No 84, p 1-12, 1973. English summary.

*Argentina(Yalca Identifiers: Pond) Azolla-Filiculoides, Meso *Arthropoda. pleuston, Pearsons, Ponds, Salvinia-Rotundifolia, *Seasonal, *Spatial variation, Correlation index.

The spatial and seasonal variation of the meso-scopic fraction of the phylum Arthropoda in a representative area of Yalca Pond as related to the dominant floating plant species: Azolla filiculoides and Salvinia rotundifolia was studied. The use of Pearson's correlation index and the similarity of the recurrent groups proves the existence of interspecific relations among some elements of the pleuston community complex. The seasonal dynamics of populations was established by sampling in definite areas during 7 sampling periods through the year.—Copyright 1974, Biological Abstractic life. stracts, Inc. W74-12399

COUGH RESPONSE AND UPTAKE OF MERCU-RY BY BROOK TROUT, SALVELINUS FON-TINALIS, EXPOSED TO MERCURIC COM-POUNDS AT DIFFERENT HYDROGEN-ION CONCENTRATIONS,
National Water Quality Lab., Duluth, Minn.

For primary bibliographic entry see Field 5C. W74-12507

DIATOMS OF THE CONCRETE EMBANK-MENT OF THE ZEGRZE LAKE, Inst. Bot., Wars. Univ., Warsaw, Pol. Warsaw

Univ. (Poland). Inst. of Botany. H. Borzdynska.

Acts Soc Bot Pol. Vol 42, No 1, p 21-40, 1973. Illus.

Identifiers: Amphora, Cymbella, *Diatoms. Navicula, Nitzschia, *Poland(Zegrze Lakes, Lake)

It was established that conditions for the development of diatoms on a concrete embankment are favorable. Beside organisms permanently or periodically connected with the solid substrate, typical planktons also occurred. The following species were most numerous: Cymbella affinis, Nitzschia kutzingiana, Amphora ovalis var. pediculus and Navicula gracilis. The most intensive development of diatoms was observed in April, May, July and Oct. The total number of organism depended on pollution of water in the Zeran Canal (Poland), increased water temperature in autumn in the section between the Canal and Bialobrzegi and intensity of waves.—Copyright 1973, Biological Abstracts, Inc. W74-12528

STUDIES ON SOUTH AMERICAN FRESH-WATER PLANKTON. NOTES ON THE PLANKTON FROM TIERRA DEL FUEGO AND VAL-

Uppsala Univ. (Sweden). Inst. of Plant Ecology. For primary bibliographic entry see Field 5C.

THE VEGETATION OF SWEDISH LAKES, For primary bibliographic entry see Field 5C. W74-12558

NOTES ON THE PLANKTON OF LAKE BANG-WEULU,

For primary bibliographic entry see Field 5C. W74-12559

FROM LAKES IN NORTHERN COLORADO,

Vaxtbiologiska Institutionen, Uppsala (Sweden). For primary bibliographic entry see Field 5C

LAKE VATTERN. OUTLINES OF ITS NATU-RAL HISTORY, ESPECIALLY ITS VEGETA-TION.

Uppsala Univ. (Sweden). Inst. for Plant Ecology. For primary bibliographic entry see Field 5C. W74-12671

BIOGEOCHEMISTRY OF THE RARE-EARTH ELEMENTS IN AQUATIC MACROPHYTES OF LINSLEY POND, NORTH BRANDFORD, CON-

Pittsburgh Univ., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5A. W74-12687

EFFECT OF MARISA CORNUARIETIS ON POPULATIONS OF BIOMPHALARIA GLABRATA IN FARM PONDS OF PUERTO

San Juan Tropical Disease Lab., Puerto Rico. W. R. Jobin, F. F. Ferguson, and L. A. Berrios-Duran.

Am J Trop Med Hyg. Vol 22, No 2, p 278-284. 1973. Illus

Descriptors: *Farm ponds, Ponds, Mollusks, Gastropods, Snails, Population, Puerto-Rico, Reser-

Identifiers: Biomphalaria-glabrata, Marisa-cor-nuarietis, Schistosoma-mansoni.

A biological control method is reported, utilizing an ampullarid snail, M. cornuarietis, to eliminate B. glabrata, the molluscan host of Schistosoma mansoni. The limitations and economics of this method required further clarification. This study was conducted in 9 small reservoirs in Puerto Rico to establish the probability of success of the method under various loading rates and vegetation conditions. Adult M. cornuarietis were trans-planted from natural habitats into 7 of 9 study ponds, all of which contained stable populations of the planorbid snails. The snail populations were monitored for almost 2 yr after the initial loading with Marisa. Although the planorbid snail populations remained strong in the untreated ponds, they were controlled in 2 of the treated ponds and sig-nificantly reduced in 3 others. In the remaining 2 treated ponds there was no significant decrease in the B. glabrata populations. There was a close corthe B. galorata populations. There was a close correlation between the success of the method and the amount of vegetation in the ponds. In the 2 ponds were the planorbid snails were controlled, there was very little vegetation. In the 2 ponds where the planorbid snails were controlled, there was very little vegetation. In the 2 ponds where the planorbids were not affected, the surfaces of the ponds were completely covered with vegetation. There was no correlation between the success of the biological control method and the rate at which the M. cornuarietis were added to the ponds. The average loading rate for all 7 ponds was 2 M. cornarietis per sq m of pond surface.--Copyright 1973, Biological Abstracts, Inc. W74-12693

SPECIES AND QUANTITATIVE CONTENT OF THE PLANKTON AND BENTHOS OF THE AGGEL' LAKE, (IN RUSSIAN),

R. A. Safarov.

Izv Akad Nauk Az SSR Ser Biol Nauk. 4, p 55-57.

Identifiers: *Benthos, *Plankton, *USSR(Aggel Lake), Zooplankton.

In a study of the zooplankton organisms of the Aggel' lake (USSR) 11 spp. and forms were noted. Among zoobenthic organisms 48 spp. and forms were recorded. Two factors determine the character of the species and quantitative content of benthos. These are a low water temperature and transparency of the lake water. Benthos comprise 30.5% of the total fauna, with average biomass at 5.24-6.51 g/sq m with variations from 3.36 to 10.10 g/sq m. Leeches, mollusks, Odonata, caddix-flies and midge larvae were predominant.-Copyright 1974, Biological Abstracts, Inc. W74-12708

MERCURY IN AQUATIC BIRDS AT CLAY LAKE, WESTERN ONTARIO,

Canadian Wildlife Service, Edmonton (Alberta). For primary bibliographic entry see Field 5C W74-12717

FAUNA AND FLORA OF THE LAKES OF FARO AND GANZIRRI: III. BIOECOLOGIC OBSER-VATIONS ON THE ECHINODERMS OF THE LAKE OF FARO (MESSINA), (IN ITALIAN), Istituto Sperimentale Talassografico, Messina (Italy)

A. Cavaliere. Biol Pesca Piscic Idrobiol. Vol 26, No 1/2, p 237-242, 1971. (English summary). Identifiers: *Echinoderms, *Italy(Lake Faro),

*Italy(Lake Ganzirri).

The morphological, biological and ecological characters of the species of echinoderms (Holothuria tubulosa, Astropecten irregularis pentacanthus, Asterina gibbosa, Ophioderma lon-gicaudum, Arbacia lixula, Sphaerechinus granu-laris, Paracentrotus lividus) in the lake of Faro (Sicily) were examined with reference to their distribution.--Copyright 1973, Biological Abstracts, W74-12732

DECOMPOSITION OF NITROGEN COM-POUNDS IN LAKE MUD IN VIEW OF NITROGEN ISOTOPE RATIOS: I. ANALYTI CAL METHOD FOR NITROGEN COMPOUNDS IN SEDIMENTS,

Yokohama Sewerage Bureau, Kanagawa (Japan). For primary bibliographic entry see Field 2K.

ON THE LITTORAL ALGAE OF THE LAKE NUUKSION PITKAJARVI, SOUTHERN FINLAND: I. ECOLOGY OF THE MOST IMPOR-

TANT ALGAL SPECIES, Helsinki Univ. (Finland). Dept. of Limnology. For primary bibliographic entry see Field 5C.

STUDIES ON GILL PARASITOSIS OF THE GRASSCARP (CTENOPHARYNGODON-IDEL-LA) CAUSED BY DACTYLOGYRUS LAMEL-LATUS ACHMEROV, 1952: IV. HISTOLOGI-CAL CHANGES,

For primary bibliographic entry see Field 5C. W74-12740

FOOD AND FEEDING HABITS OF SOME EGYPTIAN FISHES IN LAKE QUARUN: I. TILAPIA ZILLII (GERV.) B. ACCORDING TO DIFFERENT LENGTH GROUPS, S. A. Abdel-Malek

S. A. Adder-Maiek.
Bull Inst Oceanogr Fish. 2, p 204-213. 1972. Illus.
Identifiers: *Chrysophrys, *Egypt(Lake Quarun),
Mugil, Solea, Tilapia, *Fish food organisms.

The material (Tilipia zillii, Solea vulgaris, Mugil saliens, M. cephalus, M. capito, Chrysophrys aurata) was collected over a 3 mo. period from May-July 1969. The results so obtained were analyzed July 1909. The results so obtained were analyzed by using the occurrence and the points methods. According to the present data, 3 major groups were formed: A-group:30-45 mm; B-group:46-90 mm and C-group:91-250 mm. In the 3 different length groups of Bolti, the plant material were the chief food items. The importance of the animal food increases to a certain extent as the fish grows larger. It is of interest to mention, that the small (30-45 mm long) feed on a limited number of small slow-moving organisms and as they grow larger their diet becomes more varied. The change in

composition of the diet as the fish grows is an expression of increase in the minimum size of the organism eaten. Small fish are unable to swallow gaisin each. Shah is a dudad to swam who relatively large organisms such as mollusks (gastropods and Abra ovata) and polychaetes (Nereis spp.). As the fish grows larger the percentage of empty alimentary canals increases. This presumbly indicates that the fish eat more sporadically as they grow .-- Copyright 1973, Biological Abstracts, Inc.

LONG-TERM CHANGES IN THE PARASITIC FAUNA OF SOME FISH IN THE DNIESTER BASIN, (IN RUSSIAN), Zoovetervnarnyi Instytut, Lvov (USSR).

O. P. Kulakovskaya, and V. M. Ivasik. Gidrobiol Zh. Vol 9, No 1, p 70-75. 1973. (English

Identifiers: Barbus, Chondrostoma, Cyprinus, Leuciscus, Perca, Rutilus, *USSR(Dniester Leuciscus, Perca, Rutilus, basin), Vimba, *Fish parasites.

The specific structure, degree and intensity of infestation, as well as population density of parasites in 7 host fish species Rutilus rutilus, Vimba vimba Chondrostoma nasus, Perca fluviatilis, Leuciscus cephalus, Cyprinus carpio, Barbus barbus of the Upper Dniester Basin (USSR) bus barbus of the Upper Dniester Basin (USSR) showed remarkable changes within the period between 1952 and 1968. Total number of species decreased from 61-41. This reduction depends mainly on the outbreak of species with free swimming stages in their development, unprotected against the action of unfavorable environment factors.—Copyright 1973, Biological Abstracts Inc. W74-12746

PARASITES OF FISH FROM LAKE SAREZ

(PAMIRS), (IN RUSSIAN), Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii. For primary bibliographic entry see Field 5C. W74-12750

2I. Water In Plants

AN INCREASE IN EFFECTIVENESS OF MINERAL FERTILIZERS AND LIQUIDATION OF THEIR LOSSES DURING IRRIGATION, (IN RUSSIAN).

All-Union Inst. Fert. Soil Agric., Moscow

S. G. Vasileva.

Dokl Vses Ord Lenina Akad S-Kh Nauk Im V I

Lenina. 5, p 16-18, 1973.
Identifiers: Corn, Cotton, *Fertilizers, Irrigation effects, Lucerne, Sugar beets, Winter wheat.

In experiments performed on soil seeded with winter wheat, corn for grain, corn for silage, sugar beets, lucerne and cotton, the basic condition for an increase in effectiveness of mineral fertilizers appears to be an optimal level of irrigation. The correct balance of irrigation and fertilization is needed for an increase in yield.--Copyright 1973, Biological Abstracts, Inc.

SANITARY AND CHARACTERISTICS HYDROBIOLOGICAL OF THE SAMUR-N. V. Gasanov, Kh. S. Eibazova, and Kh. A. Abdullaeva.

Izv Akad Nauk Az SSR Ser Biol Nauk. p 103-107, 1972. Illus.

Amphora, *Canals, Identifiers: Amphora, "Canals, Closterium-moniligerum, Cricotopus-algarum, Cricotopus-sil-vestris, Cyclops, Diaphanosoma-brachyurum, Diaptomus-salinus, Glyptotendipes-gripekoveni, "Hydrobiological studies, Microcystis-aeruginosa, Moina-rectirostris, Nematoda, Oscillatoria-sanc-ta, Pedalia, Sanitary conditions, Tubifex-tubifex, "USSR(Samur-Apsheron canal). Hydrobiological investigations of the Samur-Apsheron Canal (USSR) are presented. The incidences of Amphora, Microcystis aeruginosa, Oscillatoria sancta, Closterium moniligerum, Diaphanosoma brachyurum, Moina rectirostris, Diaptomus salinus, Cyclops, Pedalia, Tubifex tubifex, Glyptotendipes gr. gripekoveni, Cricotopus gr. silvestris, C. gr. algarum and Nematoda were determined. Hydrochemical, sanitary, microbiological and hydrobiological findings evidence the beta-mesosaprophytic nature of the Samur-Apsheron Canal .-- Copyright 1974, Biological Abstracts, Inc. W74-12153

RIVER AS A FEEDING PLACE FOR CROWS

(CORVIDAE), Wroclaw Univ. (Poland). Muzeum Zoologiczny.

Ekol Pol. Vol 20, No 43, p 509-535, Illus, 1972. Identifiers: *Corvidae, Corvus-corone-cornix, Corvus-frugilegus, Corvus-monedula, *Crows, Feeding, *Food competition(Crows), Forests, Feeding, *Food competition(Crows), Fo Larus-ridibundus, Rivers, *Seasons, Towns.

The importance of a river as a feeding place for Corvus corone cornix, Corvus frugilegus and Corvus monedula was studied throughout a year. The relationship between diurnal activity and the importance of a river as a food supply during certain seasons of the year and the influence of riverside landscape (towns, open areas, forests) upon the number of birds feeding in certain sections of the river were indicated. The problem of food competition between C. c. cornix and Larus ridibundus was also discussed.--Copyright 1974, Biological

ALLUVIAL GRASSLAND ECOSYSTEMS:

HABITAT CHARACTERISTICS, Ceskoslovenska Akademie Ved, Brno. Botanicka

B. Ulehlova

Abstracts, Inc. W74-12158

Prirodoved Pr Ustavu Cesk Akad Ved Brne. Vol 7, No 4, p 1-41. Illus, 1973.

Identifiers: *Alluvial grasslands, Alopecurus-pratensis, *Climate, Ecosystems, Festuca-sulcata, *Grassland habitat, Minerals, Nitrogen, Organic matter, Soil moisture.

The habitat characteristics were studied in 3 alluvial grassland communities, i.e., Serratulo-Festucetum commutatae, Gratiola officinalis-Carex praecoxsuzae and Glycerietum maximae arranged from the driest to the wettest one. The climatic data for the area and years of the investigations are given. The fluctuations of the groundwater table and of soil moisture content reach the highest and lowest values in the habitat of Glycerietum maximae and Serratulo-Festucetum commutatae, respectively. pF (water holding index) curves of the soils and the composition of the rain, flood and groundwater of all habitats are presented. Lysimetric measurements were taken, and the composition of soil percolates in different soil layers was assessed. The contents of soil organic matter and soil N and their fluctuations increase from the least productive dry to the most productive wet grassland ecosystem. The contents of organic matter and N were estimated in different fractions of the humus, i. e., in the free, sorbed, and chemically bound humic substances in the soils. The character of humus is different in the soils of each plant community. Finally, the mineral composition of the shoots, roots and litter was assessed for Festuca sulcata and Alopecurus pratensis during their ontogenesis. These 2 spp. are the respective dominants of Serratulo-Festucetum commutatae and Gratiola officinalis - Carex praecox-suzae.--Copyright 1974, Biological Abstracts. Inc. W74-12161

A PHYTOCLIMATIC APPROACH TO THE PROBLEM OF MEDITERRANEITY IN THE INDO-PAKISTAN SUB-CONTINENT For primary bibliographic entry see Field 2B. W74-12162

DATA ON THE HYDROBIOLOGY OF FISH PONDS OF SOUTHERN TADZHIK SSR, (IN RUSSIAN).

Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii. For primary bibliographic entry see Field 8I. W74-12167

PHYTOPLANKTON COLLECTED BY THE 'OMBANGO' OFF ANGOLA (10-27 NOVEMBER 1965), (IN FRENCH), Museum National d'Histoire Naturelle. Paris

(France). Laboratoire des Peches Outre-Mer.

Bull Inst Fondam Afr Noire Ser A Sci Nat. Vol 34, No 4, p 796-808, 1972, Illus. English summary. Identifiers: Ceratium-furca-var-furca,

Chaetoceros-lorenzianum, Coasts, Dinophysis, Diversity, Index, Nutrients, Peridinium, *Phytoplankton, Rhizosolenia-acata-f-gracillima, Salinity, Soils, Stephanopyxis-palmeriana, Temperature, *Diatoms, *Dinoflagellates, *Africa(Angola).

Diatoms and dinoflagellates collected during the cruise of 'Ombango' along the Angola coast are inventoried. The 37 catches were made in an area comprised between 4 deg 52 min and 13 deg 55 min S i. e., from Pointe-Noire to a point south of Benguela. Catches come from the coastal waters but chiefly from the open sea extending to 9 deg 15 min E. Surface temperatures were near 24-25C. The salinity and varied considerably; a low salinity was noted southwest of Pointe-Noire; an area parwas indeed solutions to the thornwork, an area particularly reached by Congo waters. The thermocline is present in the whole area except near the coast (50 and 100 m depths) where it is divided in steps as a result of vertical movements. In all the catches, 55 spp. of Diatoms and 80 spp. of Dinoflagellates were identified. The flora is typically tropical. Populations generally are sparse and consist chiefly of Dinoflagellates (Ceratium, Peridinium, Dinophysis). However, a few blooms of diatoms appear south-west of Pointe-Noire beyond 1000 m depth and near Loanda in the coastal waters as well as in the offing. In front of Pointe-Noire, the fertility of waters is due to the arrival of freshwaters containing a great quantity of soil components. In front of Loanda, the fertility is caused by vertical movements particularly strong near the coast. The study of diversity index shows that these 2 areas have an intense activity, shows that these 2 areas have an intense activity, sharply contrasting with the other zones studied where populations have greater maturity. The main blooms were noted with the following species: Stephanopyxis palmeriana, Rhizosolenia alata f. gracillima, Chaetoceros lorenzianum. As the regards the genus Ceratium, especially diversified in the Angola waters, attention should be drawn to the different affinities of the 2 varieties of Ceratium furca: the variety furca is to be found mainly in the warm waters, the variety eugram-mum in colder waters.--Copyright 1974, Biological Abstracts, Inc.

THE KUROSHIO II. PROCEEDINGS OF THE SECOND SYMPOSIUM ON THE RESULTS OF THE COOPERATIVE STUDY OF THE KU-ROSHIO AND ADJACENT REGIONS, TOKYO, SEPT 28-OCT 7, 1970.

Saikon Publishing, Co., Tokyo, 1972, 562 p, Illus,

Identifiers: Chlorophyll, Cooperative studies, Fisheries, *Japan(Kuroshio region), Oceanography, *Pacific Ocean, Plankton, Symposia, Thermocline, Zooplankton, Publications, Primary production.

Group 21-Water In Plants

An extensive number of papers, including introductory contributions on general aspects involving the Kuroshio and adjacent regions, are presented. The majority of the contributions are presented. In a sections under the following categories: physics, chemistry and geology; biology and biochemistry; the fisheries oceanography. The first section includes papers on such topics as: occurrence of the thermocline in the shelf area south of Hong Kong; distribution of vanadium in the Kuroshio and adjacent regions; distribution of the bottom deposits on the Hong Kong fishing grounds; and study of the bottom sediments in the sea area of the west coast of Korea. The next sec tion, covers such topics as: primary production in the western tropical and subtropical Pacific Ocean; composition of organic matter in subsurface chlorophyll maxima; herbivorous zooplank-ton-food zooplankton relationships in the Western North Pacific; and occurrence of ostracods in the neighboring seas of Taiwan. The final section covers such topics as: range of the skipjack tuna subpopulation in the western Pacific Ocean; stuon spotted mackerel resources of Taiwan; identification of Nemipterus in Thailand; and the occurrence and distribution of the fish eggs and larvae in the Korean adjacent Sea. Numerous maps, tables and other illustrations are included, and each paper lists literature cited .-- Copyright 1974, Biological Abstracts, Inc.

AN OPTICAL PLANIMETER FOR LEAF AREA DETERMINATION.

Georgia Uiv., Athens. Inst. of Ecology., and Forest Service (USDA), Southeastern Forest Experiment Station. Franklin, N.C. C. S. Gist, and W. T. Swank. The American Midland Naturalist, Vol 92, No 1, p

213-217, July, 1974. 3 fig, 6 ref.

Descriptors: *Leaves, *Deciduous trees, Plant morphology. Identifiers: Leaf area index.

An optical planimeter for determining leaf area is presented. The system proposed is simple and easily used, compact and somewhat portable, accurate and species-independent with respect to estimates of leaf area. Calibration and tests have shown the system exhibits a linear response to changes in leaf area. The system was not designed to stand the rigors of field use and may prove to be a disadvantage to certain users. W74-12229

TEMPORAL CHANGES IN BIOMASS, SUR-FACE AREA AND NET PRODUCTION FOR A PINUS STROBUS L. FOREST,

Forest Service (USDA), Franklin, N.C. Southeastern Forest Experiment Station. For primary bibliographic entry see Field 4A. W74-12231

COMPARISON OF THREE METHODS OF ESTIMATING SURFACE AREA AND BIOMASS FOR A FOREST OF YOUNG EASTERN WHITE

Forest Service (USDA), Franklin, N.C. Southeast-ern Forest Experiment Station. For primary bibliographic entry see Field 4A. W74-12232

CHARACTERISTICS OF WATER REGIME OF MALE AND FEMALE DIOECIOUS PLANTS AS MALE AND FEMALE DIOBETOUS PLANTS AS A SIGN OF ADAPTATION TO A POOR WATER SUPPLY, (IN RUSSIAN), For primary bibliographic entry see Field 3F. W74-12237

TREE WATER STRESS IN RELATION TO WATER YIELD IN A HARDWOOD FOREST, New Hampshire Univ., Durham. Water Resource Research Center

For primary bibliographic entry see Field 2D.

MIGRATION OF INSECTS CAUSED BY ERECTION OF IRRIGATIONAL MAINS, (IN BUSSIAN).

A. Yagdyev Izv Akad Nauk Turkm SSR Ser Biol Nauk. 5 p 82-

83, 1971. English summary. Identifiers: Agriotes-Caspicus, Gryllus-Desertus, *Insects, *Irrigation canals, *Migration(Insects), Tenebrionidae, Structures,

Insects (46 spp.) were recorded in newly developed virgin lands. Erection of the irrigation mains caused their migration. The species include such pests as Gryllus desertus, Tenebrionidae, and Agriotes caspicus.--Copyright 1974, Biological Abstracts, Inc. W74-12396

THE STEINITZ LABORATORY OF MARINE BIOLOGY AT ELATH: AN OPEN DOOR ON THE TROPICAL SEAS, (IN FRENCH),

Cah Biol Mar. 14 p 407-411, 1973. Can Biol Mar. 14 p 407-411, 1973. Identifiers: "Avicennia-Officinalis, Biology, Echinoderms, Fish, "Halophila-Sp, "Israel(Gulf of Aqaba), Mollusks, Plankton, Scleractinia, Seas, "Siganus-Sp, Tropical studies, "Marine laborato-

The services and equipment of the Steinitz laboratory at Elath (Israel), on the Gulf of Agaba, noted for its extreme narrowness, high saline stratification, clearness and absence of alluvial influences in its warm heliothermic bays, lagoons and reefs are discussed. Studies are conducted by Israeli and foreign biologists in the taxonomy, ecology, marine microbiology, electrophysiology, oceanography, sedimentology and limnology of the area which is rich in various species of Scleractinia, fish, mollusks and echinoderms. Plankton are very poorly represented in the Erythyrean region. Notable experiments have thus far been conducted with species of Siganus and populations of Halphila and Avicennia officialis.--Copyright 1974, Biological Abstracts, Inc. W74-12398

DEPENDENCE OF PHOTOSYNTHESIS ON TEMPERATURE IN TUNDRA PLANTS OF WRANGEL ISLAND, (IN RUSSIAN), Akademiya Nauk SSSR, Leningard. Botanicheskii

Institut.

T. V. Gerasimenko. Bot Zh. Vol 58, No 4, p 493-504. 1973. Illus, En-

glish summary.
Identifiers: Alopecurus-alpinus, Artemisia-fur-Astragalus-umbellatus, Carex-lugens, Claytonia-arctica, Dryas-punctata, Islands, Lagotis-minor, Nardosmia-frigida, Nardosmia-frigida, rstands, Lagous-innot, Values of Plants, Rhodiola-borealis, Rumex-arcticus, Russian-SFSR, Salix-glauca, Salix-phlebophylla, Saussurea-tilesii, *Temperature, *Tundra, *USSR(Wrangel Island). Rumex-arcticus, F Salix-phlebophylla,

Temperature effect of the photosynthesis of arctic plants is of great interest. The dependece of photosynthesis on temperature during different terms of vegetative period had been studied by the radiometrical method in 14 spp. of higher plants (Claytonia arctica, Rhodiola borealis, Astragalus umbellatus, Lagotis minor, Artemisia furcata, Nardosmia frigeda, Saussurea tilesii, Dryas punctata, Salix glauca, S. phlebophylla, Carex lugens, Alopercurus alpinus, Caltha arctica, Rumex arcticus) from the Wrangel island (Russian S FSR USSR). Photosynthesis can take place in a wide range of temperatures, from minus 3 deg to plus 45 deg; the optimal temperature zone being about plus 20 deg, which is much higher than the prevailng temperature in natural habitat conditions. It is shown that the temperature optimum of photosynthesis remains the same all through the period of vegetation. The data presented show the wide range of adaptation of the plants' assimila-tion apparatus to different temperatures.--Copy-right 1974, Biological Abstracts, Inc. W74-12481

AQUATIC HIGHER VEGETATION AS A COM-PONENT OF AN AQUATIC BIOGEOCENOSIS, (IN RUSSIAN),

Akademiya Nauk SSSR, Moscow. Dept. of General Biology.

A. P. Belavskaya. Gidrobiol Zh. Vol 9, No 1, p 31-35, 1973. English

Identifiers: *Biogeocenosis, *Vegetation, USSR.

Significance of higher vegetation in the life of a water body and the necessity of its study by mean of geobotanical methods are reviewed .-- Copyright 3, Biological Abstracts, Inc.

LEAF ANATOMICAL AND PHOTOSYNTHETI-CAL REACTIONS OF QUERCUS PUBESCENS WILLD. TO ENVIRONMENTAL FACTORS IN VARIOUS ECOSYSTEMS: I. LEAF ANATOMI-CAL REACTIONS, National Museum of Natural History, Budapest

(Hungary). Dept. of Botany. G. Fekete, and J. Szujko-Lacza

Acta Bot Acad Sci Hung. Vol 18, No 1/2, p 59-89, 1973. Illus.

Identifiers: *Leaves, Mesophyll, *Photosynthesis, Ouercus-pubescens, *Oak trees.

The ecological inquiry of this work concerns the changes in 4 anatomical characteristics in the leaves of Quercus pubescens, under the influence of environmental factors. From 2 levels of light and water supply and the combinations of these, 4 habitat types were selected. The rate of palisade per spongy parenchyma and the size of the mesophyll chambers react in the same way to the combinations of the 2 factors. The effect of light along on the rate of palisade per spongy parenchyma is significant; while on the size of mesophyll chamber each of the 2 factors has a significant influence; on the intercellular rate and stoma frequency only the effect of the water factor is significant in itself. At a lower level of light intensity the leaf anatomical characteristics are more stable against the effects of the water supply of the soil than under more intensive light condi-tions. The intercellular rate is correlated with the size of mesophyll chambers and with stoma frequency. The mesophyll chamber can be conceived of not only as a unit of gas supply, but as the unit producing the transporting organic matter.—Copyright 1973, Biological Abstracts, Inc. W74-12545

INDICATOR SPECIES IN THE DESMID STAU-RASTRUM.

Connecticut Univ., Storrs. Inst. of Water Resources

For primary bibliographic entry see Field 5A. W74-12597

PRODUCTIVITY BIOMASS, PHYTOGEOCHEMISTRY OF THE VEGETA-TION OF THE BANKS OF AN ARDENNE STREAM (GEMBES BROOK, AT DAVERDISSE, ARDENNE, LUXEMBOURG): III. SURVEY ON THE BIOMASS AND PRODUCTIVITY OF THE WOODLY STRATUM OF AN ISLAND OF THE MACHE VALLEY),
Brussels Univ. (Belgium). Laboratoire de

Butasses Con. (Geogram). Laboration education and Botanique Systematique et d'Ecologie. P. Kestemont, J. Timperman, and J. C. Moniquet. Bull Soc R Bot Belg. Vol 105, No 2, p 309-319, 1972, Illus, English summary.

Identifiers: Alnus-glutinosa, Corylus-avellana, Luxembourg, *Vegetation, *Primary production, *Forests, Biomass, *Luxembourg.

Primary production of a forest of Alnus glutinosa and Corylus avellana established on a Mache's isle, near Daverdisse (Belgium) was determined. Surface of this isle has been estimated about 900 m2. On this isle, aerial biomass (wood and bark) reached 9.78 t and annual aerial productivity reached 876 kg/yr.—Copyright 1973, Biological Abstracts, Inc. W74-12617

WATER STATUS OF HERBACEOUS DOMINANTS ON BOTTOM DEPOSITS FREED FROM LAKE SEVAN, (IN RUSSIAN), N. A. Papikyan, and A. M. Barsegyan

Tr Bot Inst Akad Nauk Arm SSR. 18, p 128-138.

Identifiers: Armenian-SSR. *Reeds. *Transpiration, Plant succession, *USSR(Lake Sevan), Lakes.

Investigations of the main indexes of the water status (transpiration rate, water deficit, water-retaining capacity) of the most widespread and characteristic plants of the Sevan bottom deposits (Armenian SSR, USSR) revealed that the depend on the ability of plants to regulate transpiration. Species not able to regulate transpiration. under unfavorable environmental conditions disappear from the structure of the phytocenoses and, conversely, species manifesting a higher degree of plasticity to self-regulation of the water status become dominant. The common reed is the standard of self-regulation of transpiration on Sevan bottom deposits.--Copyright 1973, Biological Abstracts, Inc. W74-12665

TYPOLOGICAL EVALUATION OF VEGETA-TION IN THE LOWER CIRCLE OF WESTERN PAMIR BASED ON EXPERIMENTAL STUDY ON THE CHANGEABILITY OF ASSOCIA-TIONS, (IN RUSSIAN), Kh. Yu. Yusufbekov, and O. E. Agakhanyants. Dokl Akad Nauk Tadzh SSR. Vol 15, No 11, p 52-

Identifiers: *Artemisia, *Plant associations, Stipa-badachschanica, *Vegetation, *USSR(Western

Two localities of Artemisia vachanica associations Two localities of Artemisia vachanica associations in this region, 2320 m above sea level, the one toward WSW, slope 8, the second to NW, slope 15, were studied and described repeatedly in 2 dry years (1959, 1971) and in a moist year (1972). This type of plant association is widely distributed in the lower vegetation circle of West Pamir (USSR) and is characterized by a quite rich composition of species. Observations showed that during the moist year, these associations, which before were evaluated as indisputable desert associations. evaluated as indisputable desert associations, acquired distinct features of steppe associations. This finding was one of the 3 main facts on which the new proposed typological reevaluation of associations in this region was based. The 2nd fact was the observation that A. vachanica during dry years was noticeably oppressed in these associa-tions and that its generative shoots almost did not develop. During a rainy year the A. vachanica as-sociation in the locality toward WSW was transformed into a multigrass and mat-grass steepe (the edificator grass was Stipabadachschanica Roshev), increasing the grass yield 3-fold (from 3.8 to 10.2 centn/ha). Thus, increased moisture did call to life steppe associations that were considered to be desert associations,—Copyright 1973, Biological Abstracts, Inc. W74-12678

SYSTEMATICS AND ECOLOGY OF THE ISEF-JORD MARINE FAUNA (DENMARK): WITH A SURVEY OF THE EELGRASS (ZOSTERA) VEGETATION AND ITS COMMUNITIES, Isefjord Lab., Vellerup Vig (Denmark). Ophelia. Vol 11, No 1/2, p 1-495. 1973. Illus.

Descriptors: *Fjords, Sands, Mud, Aquatic animals, Fish, Saline water, Brackish water, Estuaries, Phytoplankton, Aquatic plants, Plank ton, Water pollution, Shore protection, Wildlife, Environmental effects.

*Denmark. Identifiers: Chordates. Eelgrass, Fauna, Fishes, Isefjord, Mediomastusfragilis, Pollution, Reproduction, Systematics, Vegetation, Zostera, Zostera-Marina, Vellerup Vig, Zealanu, North Atlantic. Zealand, Roskildefjords, Invertebrates,

This paper represents the results of more than 30 yr field observations and research work carried out from the Isefjord Laboratory, Vellerup Vig (Zealand, Demark). The Isefjord complex 36 km long, including the main fjord and the Roskilde Fjord, and covering about 400 sq km, is a shallow (7-10 m, maximum 30 m) area dominated by substrata of fine sand to mud with a high content of organic matter. The 1st part gives information about distribution, systematics, ecology and breeding of the majority of the 477 animal species described. Nearly 400 spp. are invertebrates and of the chordates 68 species are true fishes. Of all animal species, 63% have not previously been recorded from the area, 27 spp. are new to Danish seas and one (Mediomastus fragilis) (Polychaeta, Capitellidae) is new. The hydrography is treated mainly on the basis of literature. The fjord system may be classified as mixohaline: the Isefjord proper is polyhaline (18 + -30 plus or minus %), and the Roskilde Fjord is mesohaline (5 plus or minus 18 plus or minus %). From April to Aug. the Isefiord interior can be classified as a hypersaline isetjord interior can be classified as a hypersaine estuary due to reduced precipitation and evaporation in connection with high water temperature. The water exchange between the fjord and the Kattegat is insignificant apart from that caused by wind pressure in winter and autumn. The tidal range (about 20 cm) is only of local importance. The water temperature essentially follows that of the air (shallow area) and normally fluctuates from negative temperatures with ice layer in the winter to summer temperatures often far above 20 degrees C. The recent climatic changes in the North Atlantic are discussed and it is shown that the surface water temperature increased con-siderably from 1930-50 not only in the Isefjord complex but in practically all interior Danish waters, while salimity changes have been of minor importance. The annual gross production of phytoplankton in the Isefjord is exceptionally high in comparison with that of other larger Danish seas and the primary production reaches values of a eutrophic freshwater lake. The eelgrass (Zostera marina) vegetation is treated in a special chapter and the extensive literature concerning the socalled disease and destruction of the eelgrass (1933-34) in northern Atlantic waters is discussed. l'emperature and eelgrass conditions in the Isefjord suggest that recent climatic change (increased temperature) is the primary reason for the decline not disease or parasitic attack. The effect of the disappearance of the Zostera on environmental factors and fauna is demonstrated and the importance of the eelgrass as shore protection is shown. The final chapters give a broad ecological outline of the area and treat species composition and distribution, specific morphological variation, reproduction and larval development (for inver-tebrates) and the influence of environmental facteorates) and the influence of environmental fac-tors, especially temperature and salinity, on the fauna. Finally, pollution problems are discussed.— Copyright 1974, Biological Abstracts, Inc. W74-12681

VEGETATION CHANGES IN SHALLOW MARSH WETLANDS MOISTURE REGIME, UNDER IMPROVING

Canadian Wildlife Service. Saskatoon (Saskatchewan). (Saskatchewan). J. B. Millar. Can J Bot. Vol 51, No 8, p 1443-1457. 1973. Illus.

Descriptors: *Marshes, Grasslands, *Vegetation, Cover crops, *Wetlands, Plant growth, Marsh

plants, Shallow marshes, Waterfowl, Aquatic life, Habitats, Wildlife habitats, *Moisture.

Identifiers: Alopecurus-aequalis, Beckmannia-syzigachne, Eleocharis-palustris, Glyceria-gran-dis, Glyceria-pulchella, Polygonum-coccineum, Scolochioa-festucacea, *Canada(Saskatchewan).

Changes in species composition and plant cover were studied in relation to moisture regime over a 10-vr period in 71 shallow marsh-wetlands in the grassland and parkland regions of Saskatchewan (Canada). Decreases in density of the shallow marsh emergents Polygonum coccineum. Carex atherodes, Scolochloa festucacea and Eleocharis palustris occurred with greater-than-normal water depth at the start of the growing season, but 2 or more years of continuous flooding were required to eliminate emergent cover completely and convert the wetland to open water. Repeated autumn reflooding also resulted in complete elimination of emergent species. Changes in species composition occurred when basins were grazed and as vegeta-tion reestablished after cultivation, but no changes followed mowing or burning. Alopecurus aequalis, Beckmannia syzigachne, Glyceria grandis and G. pulchella are designated as 'disturbance' species on the basis of their response to soil-exposing events. Presence of small amounts of deep marsh emergents in shallow marsh wetlands is not considered a reliable indicator of wetter moisture regime. Species composition of rooted submer-gents in a wetland can be used as an indicator of its moisture regime. Shallow marsh wetlands in basins of 1 ac (0.41 ha) or less experienced little only atypical conditions. Larger wetlands required basin depths in excess of 36 in. 996.4 cm) to have any amount of year-long flooding and to convert to open water. These basin size and depth criteria have applications in habitat evaluation by waterfowl managers.--Copyright 1974, Biological Abstracts, Inc. W74-12682

FACTORS LIMITING THE DISTRIBUTION OF

SALIX NIGRA, Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
K. W. McLeod, and J. K. McPherson.
Bull Torrey Bot Club. Vol 100, No 2, p 102-110.

1973. Illus

Descriptors: *Willow trees, Trees, Plant growth, Life cycles, *Oklahoma.

Identifiers: *Black willow, *Salix-Nigra.

Soil moisture, nutrient content, structure and aeration do not appear to limit the distribution of adult black willows in Oklahoma (USA). Instead, the species appears to be limited by the requirements for seed germination and seedling establishment which are met on moist or wet soil. These conditions usually exist only around a permanent source of water where the soil remains wet for an ex-tended period. As determined by pot tests, established plants do not have a high moisture requirement and hence the species could survive in a broader range of environmental conditions than it is restricted to by its seedlings.--Copyright 1974, Biological Abstracts, Inc. W74-12684

AZOTOBACTER CHROOCOCCUM IN THE PHYLLOSPHERE OF WATER HYACINTH (EICHHORNIA CRASSIPES MERT, SOLMS), Indian Agricultural Research Inst., New Delhi. Div. of Microbiology. V. Iswaran, A. Sen, and R. Apte.

Plant Soil. Vol 39, No 2, p 461-463. 1973. Illus.

Descriptors: *Water hyacinth, Floating plants, Aquatic plants, Aquatic weeds, Aquatic productivity, Growth rates, *Plant growth, Nitrogen. Identifiers: *Azotobacter-chroococcum, Eichhornia-crassipes, Phyllosphere.

Group 21-Water In Plants

E. crassipes harbors A. chroococcum in large numbers on and in its leaves. This may account for the prolific growth of the plants in water containing only traces of combined N.--Copyright 1974, Biological Abstracts, Inc. W74-12686

SEED WEIGHT IN RELATION TO ENVIRON-MENTAL CONDITIONS IN CALIFORNIA, California Univ., Berkeley. Dept. of Botany.

H. G. Baker. Ecology. Vol 53, No 6, p 997-1010. 1972, Illus

Descriptors: *Environmental effects, *Seeds, Weight, *Ecology, California, Shrubs, Trees. Identifiers: Herbs, Ranunculus, Taxa.

Analyses of the California flora involving nearly 2500 taxa are presented which show that there are correlations between the weights of individual seeds and environmental conditions in which their producers normally grow. These differences in seed weight appear to be adaptive and result from compromises between increased nutrition of the seedling which would result from larger food reserves in heavier seeds and increased dispersibility and increased reproductive output which are provided when smaller seeds are produced in larger numbers. Literature and experiments show a general positive correlation between seed weights and rates of shoot and root growth, at least within species. Herbs (annual and perennial), shrubs and trees are necessarily treated separately in the calculations (for seed weights increase progressively in a series from annual herb to tree when the California flora or any particular com-munity type within it are considered). Raw seed weights are reduced to a series of classes (on a logarithmic basis) before means for floras or community types are calculated. Generalizations arrived at from considerations of 'native' species in 'natural' plant communities are confirmed by their applicability to 'introduced' species now forming various kinds of 'weed' communities in California. Finally, species lists from actual stand analyses, including both 'native' and 'introduced' species, are utilized to provide the data for more precise analyses.--Copyright 1973, Biological Abstracts, W74-12697

INTENSIVE CULTURAL PRACTICES INCREASE GROWTH OF JUVENILE SLASH PINE IN FLORIDA SANDHILLS,

Forest Service (USDA), Stoneville, Miss. Southeastern Forest Experiment Station.

J. B. Baker.
For Sci., Vol 19, No 3, p 197-202. Illus. 1973.
Identifiers: Control, Cultural, Fertilizers,
*Florida, *Growth rates, *Irrigation, Juveniles,
Moisture, Nitrogen, Nutrients, Phosphorus,
*Pine(Slash), Pinus-elliotti, Sandhills, Soil, Weed.

Growth of slash pine (Pinus elliottii) planted on a well-prepared Florida, USA, sandhill site and treated with NP fertilizer, irrigation and weed control (applied singly and in factorial combination) was improved in almost direct proportion to the number of treatments applied. Five years after planting, untreated trees averaged 1.7 m tall, 1.52 cm dbh (diameter, breast height) and 821 cu cm in stemwood volume. In contrast, trees subjected to any single treatment, 2 combined treatments, or 3 combined treatments were about 45, 70 and 110% taller; 100, 150 and 230% larger in dbh; and contained 90, 170 and 330% more stemwood volume. Both available soil moisture and nutrients limited tree growth on these sites during various times of the year. Soil moisture deficiencies during the previous fall and current spring restricted elongation of the 1st flush of growth, while nutrient deficiencies limited elongation of subsequent or late flushes as well as diameter growth. Factorial combinations of treatments generally resulted in lower concentrations of N and K in current annual foliage, while fertilization caused slightly higher

concentrations of foliar P. Both weed control and irrigation increased available soil moisture and thus decreased the number of days during the growing season that trees were growing under moisture stress.—Copyright 1974, Biological Abstracts, Inc.

ROOT ADAPTATIONS AND RELATIVE FLOOD TOLERANCE OF FIVE HARDWOOD SPECIES, Clemson Univ., S.C. Dept. of Forestry. D. Hook, and C. L. Brown.

D. Hook, and C. L. Brown.
For Sci., Vol 19, No 3, p 225-229. Illus. 1973.
Identifiers: Adaptations, *Flood tolerance(Trees),
Fraxinus-pennsylvanica, *Hardwood, Liquidambar-styraciflua, Liriodendron-tulipifera, Nyssaaquatica, Platanus-occidentalis, *Root system,
Plant species

Flooding experiments, in a growth chamber and a greenhouse, showed that height growth and root adaptations of yellow poplar, sycamore, green ash, sweet gum, and water tupelo (Liriodendron tulipifera L., Platanus occidentalis L., Fraxinus pennsylvanica Marsh., Liquidambar styraciflua L., Nyssa aquatica L., respectively) were correlated with flood tolerance. All except yellow poplar could be spatially separated along a relative flood tolerance scale by the presence or absence of 1 or more root adaptations. Water tupelo and green ash could be separated only by degree of development of root adaptations.—Copyright 1974, Biological Abstracts, Inc. W74-12702

CONTRIBUTIONS TO WATER REQUIREMENTS OF WHEAT UNDER DESERT CONDITIONS.

Cairo Univ., Giza (Egypt). Dept. of Botany. A. A. Abd-El-Rahman, and F. A. Marei. Flora (Jena). Vol 161, No 5/6, p 539-554, 1972. Illus.

Descriptors: *Wheat, *Deserts, *Plant growth, Osmotic pressure, Wilting point, Drought tolerance, Transpiration, Penetration.

Wheat was grown at different levels of water supply 200-600 mm. A water supply equivalent to 200 mm was found to be the least level required for grain production. At this level the plant tissues suffered a water deficit of about 34%. Under dry conditions the maximum vertical depth reached by the root was 25.9 cm, whereas under wet conditions the maximum vertical depth attained by roots was 68.2 cm. Under unfavorable dry conditions the root demonstrated a consistent slow growth throughout the growth period. Under the favorable conditions, the root exhibited rapid growth in length in the 1st mo. after sowing, followed by very slow growth. It ceases to grow after 2 mo. The desiccation of leaves started in plants exposed to 4 wk of drought with 1 dry basal leaf. The permanent wilting percentage of the soil was reached when the dry period reached 7 wk. The plants, however, survived. The terminal bud was protected by the rolling top leaves and remained unin-jured. The transpiration rate exhibited a pronounced decrease when the drought period exceeded 5 wk. Plants subjected to a 7 wk dry period suffered a saturation deficit of about 50%. The osmotic pressure exhibited a great rise with the extension of the drought period reaching 38.1 atm after 6 wk of drought compared with 16.3 atm after 3 wk from irrigation. Plants subjected to a drought period of 7 wk and more failed to produce grains; the ears were empty .-- Copyright 1973, Biological W74-12721

HYDROCHEMICAL LIVING CONDITIONS OF IMMATURE STAGES OF BOOPHTHORA ERYTHROCEPHALA DE GEER (DIPTERA,

SIMULIDAE): 1. FIELD STUDIES, (IN GER-MAN).

MAN), Tuebingen Univ. (West Germany). Tropenmedizinisches Institut. J. Grunewald.

Z Tropenmed Parasitol. Vol 23, No 4, p 432-445, 1972. Illus. (English summary). Identifiers: *Boophthora, *Diptera, *Germany, Simuliidae, *Blackflies.

Over a period of 6 yr (1960, 1961, 1967-1970) water samples were collected at 149 sites from the great river systems of South-West Germany during all season and at various times of day. For analysis the following 19 factors were determined: water temperature, current velocity, pH value, conductivity, free CO2, O2 content, water hardness, Ca, Mg, alkalinity, consumption of potassium permanganate, chloride, sulfate, ammonia, nitrite, nitrate, phosphate, total Fe, and silicate. At 4 breeding sites of B. erythrocephala a characteristic combination of factors was found which was quite distinct from those of other species of blackflies. Rearing experiments carried out under laboratory conditions (Part 2) were based on this specific combination.—Copyright 1973, Biological Abstracts, Inc.

ECOLOGICAL STUDIES ON MENTHA PIPERITA L.: II. EFFECT OF DIFFERENT LIGHT INTENSITIES ON WATER RELATIONS, Naples Univ. (Italy). Instituto di Botanica. Virzo De Santo.

Oecol Plant. Vol 8, No 1, p 25-40, 1973. Illus. Identifiers: Light, *Mentha-piperita, *Soil moisture, Plant growth, Growth rates.

Investigations were made on the water relations of M. piperita L. plants grown in full daylight (plot D and at different percentages of natural sunlight, under artificial shades (plot C: 78%, plot B: 44% and plot A: 14% relative light intensity). This species exerts a marked control over water loss. In the more severe environmental conditions (higher evaporative demand and lower soil water supply) of the plot D, in full sunlight, the plants develop larger water deficits than the plants in the shaded plots. M. piperita plants at 44% relative light intensity (plot B) show higher relative transpiration rate than sun plants (plot D). This fact indicates that stomata in leaves of plot B show a smaller degree of closure and this favors any gas exchange. The present data offer a further explanation for equal growth rates of plants at 100% and 44% daylight despite the differing light intensities. At 14% daylight, M. piperita develops the extreme shade form with peculiar features.—Copyright 1974, Biological Abstracts, Inc. W74-12730

LEISHMANIASIS IN BRAZIL: VI. OBSERVA-TIONS OF THE SEASONAL VARIATIONS OF LUTZOMYIA FLAVISCUTELLATA IN DIF-FERENT TYPES OF FOREST AND ITS RELA-TIONSHIP TO ENZOOTIC RODENT LEISH-MANIASIS (LEISHMANIA MEXICANA AMAZONENSIS),

AMAZONENSIS), Instituto Evandro Chagas, Belem (Brazil). Wellcome Parasitology Unit. J. Shaw, and R. Lainson.

Trans R Soc Trop Med Hyg. Vol 66, No 5, p 709-717, 1972. Illus.

Identifiers: *Brazil, *Leishmania, *Leishmaniasis, Lutzomyia, Rodents, *Vectors(Biology), Human parasites.

The seasonal fluctuation of Lu. Flaviscutellata is closely related to rainfall. The population of this species declines during the rainy season (May-March) and increases again during the dry season, reaching a peak toward Dec. and Jan. The numbers of Lu. flaviscutellata caught in various types of forest were compared. This species is more common in the wetter forests of the 'igapo' than in the drier 'terra firme' forests, although similar

seasonal fluctuations are noted in both types of forest. The close correlation between the numbers of Lu. flaviscutellata and the incidence of initial infections of Le. mexicana amazonensis in Oryzo-mys capito indicates that the major factor con-rrolling the incidence of leishmaniasis is the number of sandflies. (See also W74-12735)-Copyright 1973, Biological Abstracts Inc. W74-12734

LEISHMANIASIS IN BRAZIL: VII. FURTHER OBSERVATIONS ON THE FEEDING HABITATS OF LUTZOMYIA FLAVISCUTEL-LATA (MANGABEIRA) WITH PARTICULAR REFERENCE TO ITS BITING HABITS AT DIF-

FERENT HEIGHTS, Instituto Evandro Chagas, Belem (Brazil). Well-

come Parasitology Unit. Come Parasitology Unit.

J. J. Shaw, R. Lainson, and R. D. Ward.

Trans R Soc Trop Med Hyg. Vol 66, No 5, p 718-

Identifiers: *Brazil. *Leishmaniasis, Lutzomvia-Flaviscutellata, Mangabeira, Oryzomys, Proechimys, *Vectors(Biology), Human parasite

Lu. flaviscutellata is limited in its vertical distribution to a narrow zone just above the forest floor. The very high incidence of Leishmania mexicana amazonensis in ground-loving rodents of the genera Oryzomys and Proechimys, and the location of lesions in man caused by this parasite on the lower parts of the body, both appear to reflect the limited vertical distribution of the sandfly vector. The general lack of human infections of Le. m. amazonensis appears to be associated with the general reluctance of the vector, Lu. flaviscutellata, to bite man. When man enters an area where there are large numbers of Lu. flaviscutellata. such as in the wetter forests, the fly/man contact is raised to such a level that transmission of Le. m amazonensis to man is possible. Such conditions, as judged by the low incidence of Le. m. amazonensis in man, are rare and do not exist in the drier forests where man commonly contracts cutaneous and mucocutaneous leishmaniasis caused by Leishmania of the Le. braziliensis complex. (See also W74-12734)—Copyright 1973, Biological Abstracts, Inc.

ECO-PHYSIOLOGICAL STUDIES ON DESERT PLANTS: VIII. ROOT PENETRATION OF LEP-TADENIA PYROTECHNICA (FORSK.) DECNE. IN RELATION TO ITS WATER BALANCE.

Cairo Univ., Giza (Egypt). Dept. of Botany. K. H. Batanouny, and A. M. Abdel Wahab. Oecologia (Berl). Vol 11, No 2, p 151-161. 1973.

Identifiers: *Leptadenia, *Soil moisture, Roots.

.. pyrotechnica is a leafless tree growing under adverse arid conditions in the valleys of the East-ern Desert in Egypt. The plant cover in areas inhabited by the species in very low and amounts to only 1% in some localities. In such an open vegetation competition between roots is lacking and each root system monopolizes a huge volume of soil. The root system of a small Leptadenia bush penetrates to a depth of 11.5 m and has a lateral extension of 10 m. The root system exploits about 850 cu m of soil. The distribution of the roots and their branching is closely related to the availability of the soil moisture in the different strata. The available soil moisture is not uniform throughout the whole profile. Depending on the average available soil moisture at the different depths, the total available moisture on the soil volume occu-pies by the root system of Leptadenia bush is found to be about 23,000 kg. The annual water output by the studied bush is found to be 5700 kg. This means that the available water in the soil occupied by the root system is sufficient to supply the plant for a period of 4 yr without replenishment by rain-fall. The present study shows that the plant can live safely for several years under the severe conditions of the desert. The plant possesses some characteristics which help it to keep its water balance positive through increased absorption.--Copyright 1973, Biological Abstracts, Inc. W74-12743

CHARACTERISTICS OF THE WATER REGIME OF PEAS AT DIFFERENT SOIL MOISTURE LEVELS AND WITH THE USE OF MOLYB-DENUM, (IN RUSSIAN),

V. P. Zaslonkin. V. P. Zasionkin. Biol Nauki. Vol 16, No 2, p 82-86. 1973. Identifiers: *Molybdenum, *Peas, Transpiration, Soil moisture.

Under the effect of drought the total water content in pea leaves, rate of transpiration and water uptake by the root system decrease, whereas the content of bound water increases. Mo increases the content of total and bound water in pea levels The transpiration rate under the effect of Mo under optimal water supply conditions of the plants increases in the morning and decreases during the afternoon and evening; under drought con-ditions it decreases all day. The uptake of water by the root system increases in the presence of an op-timal water supply of the plants and decreases under drought conditions.—Copyright 1973, Biological Abstracts, Inc.

2J. Erosion and Sedimentation

DEEP SEA DRILLING PROJECT, OPERA-TIONS RESUMES, LEG 19 THROUGH LEG 25, JULY 20, 1971 THROUGH AUGUST 22, 1972. Scripps Institution of Oceanography, La Jolla,

Available from NTIS, Springfield, Va. 22161 as Available Holm 1813, Springhed, va. 22101 as PB-212 399. Price \$4.50 printed copy; \$2.25 microfiche. Technical Report No 5, Contract Re-port for National Science Foundation, October 1972. 120 p. Contract NSF C-482.

Descriptors: *Oceanography, *Bottom sediments, *Core drilling, Core logging, Cores, Sampling, Boreholes. Identifiers: *Deep Sea Drilling Project.

Operations resumes for Leg 19 through Leg 25 of the Deep Sea Drilling Project cover drilling and coring work in the deep oceans of the world. The Deep Sea Drilling Project is part of the National Science Foundation, National Ocean Sediment Coring Program. The resumes list technical achievements, drilling and coring results, drill bit performance and improvements, coring equipment modifications, tests of new procedures and equip-ment, improvements of drilling and coring procedures, plus problems encountered and an-ticipated and the steps taken or proposed. (Knapp-USGS) W74-12017

SEDIMENT TRANSPORT BY STREAMS IN THE DESCHUTES AND NISQUALLY RIVER BASINS, WASHINGTON, NOVEMBER 1971-JUNE 1973,

Geological Survey, Tacoma, Wash. .. M. Nelson.

Open-file report, 1974. 33 p, 19 fig, 2 tab, 13 ref.

Descriptors: *Sediment yield, *Sediment transport, *Washington, Sedimentation, Reservoir silting, Sediment load, Erosion, Topography.
Identifiers: *Deschutes River basin
Nisqually River basin(Wash). basin(Wash),

Fluvial-sediment transport was studied in the Deschutes and Nisqually River basins, Washington. These two adjacent basins in southwestern Washington cover about 874 square miles and range in altitude from sea level to about 14,400 feet on Mount Rainier. The topographic relief is modified by glaciation, and landforms include steep mountain slopes, colling foothills, and lowland glacial-drift plains separated by river flood plains. Abundant precipitation, ranging from slightly less than 40 inches to more than 140 inches sustains a thick vegetative cover over most of the area. The measured suspended-sediment concentrations in streams in the two basins ranged from less than 1 to 8,650 milligrams per liter and reflected a rapid increase in concentration with in-creasing streamflow. The probable annual creasing streamflow. The probable annual suspended-sediment yields ranged from 20 tons per square mile to 2,500 tons per square mile. Probable annual sediment discharge of the Deschutes River at Olympia is 25,000 tons, while that of the Nisqually River near Nisqually is 105,000 tons. Annually, most of the sediment is transported in a few days during periods of high streamflow. Little sediment is eroded from the lowlands; most of the sediment originates in the mountains. Except for deposition of sediment in Alder Reservoir and Capitol Lake, only slight changes in the sediment-transport pattern probably occur as a result of human activity. (Knapp-USGS) W74-12058

FIELD AND MODEL STUDIES ON A SILTA-TION PROBLEM IN THE FRASER RIVER, Department of Public Works, Vancouver (British For primary bibliographic entry see Field 8A. W74-12089

LABORATORY STUDY OF SCOUR AT CHAN-NEL BENDS, Research Council of Alberta, Edmonton. For primary bibliographic entry see Field 8B. W74-12094

A COMPUTER SIMULATION OF THE MOTION OF A SOLID PARTICLE IN A TURBULENT FLOW WITH FREE SURFACE,

Canada Centre for Inland Waters, Burlington (Ontario). For primary bibliographic entry see Field 8B. W74-12106

DETERMINATION OF TRACE METAL POLLU-TANTS IN WATER RESOURCES AND STREAM

SEDIMENTS, Dayton Univ., Ohio. For primary bibliographic entry see Field 5A. W74-12194

METAL DISTRIBUTION ALONG A PROFILE OF AN INTER-TIDAL AREA,

Stockholm Univ. (Sweden). Geological Inst For primary bibliographic entry see Field 5B. W74-12280

THE HYDROMETER METHOD FOR DETAILED PARTICLE-SIZE ANALYSIS: GRAPHICAL INTERPRETATION HYDROMETER READINGS AND TEST OF

Agriculture Research Service, Brawley, Calif. Imperial Valley Conservation Research Center. M. T. Kaddah. Soil Science, Vol 118, No 2, p 102-108, August 1974. 3 fig. 2 tab, 21 ref.

Descriptors: *Sediment distribution, *Particle
Stokes Law, *California, size, *Hydrometers, *Stokes Law, *C Soil properties, Soil physics, Silts, Clays. Identifiers: *Imperial Valley(Calif), Bouyoucos hydrometer, Casagrande's method, Pipet method.

The hydrometer method usually has been tested against the pipet method for determination of total silt and clay (50-2 microns, less than 2 microns in diameter). For analysis of more silt and clay size fractions (i.e., 50-20, 20-10, 10-5, 5-2, 2-1, less than

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1 micron), this study showed no difference between the two methods. The hydrometer method also gave, by subtraction, results comparable to the wet sieve method for particles greater than 43 and 53 microns. Frequent insertion and removal of the hydrometer from suspension, as needed in detailed particle-size analysis, did not affect the accuracy of the hydrometer method. Hydrometer specifications were used to calculate and plot hydrometer readings versus particle diameter at different time intervals after initiation of sedimentation. The procedure facilitated calculation of particle size distribution. (Gibb-ISWS)

LITHOFACIES RELATIONS IN THE LATE QUATERNARY NIGER DELTA COMPLEX, Koninklijke Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands). For primary bibliographic entry see Field 2L. W74-12305

ESTIMATION OF RAINFALL EROSION INDEX, Engineering-Science, Inc., Berkeley, Calif.

J. K. H. Ateshian.

Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 100, No IR3, p 293-307, September 1974. 7 fig. 5 tab, 8 ref, 2 append. EPA Contract 68-01-0755.

Descriptors: *Erosion control, *Soil erosion, *Rainfall, *Soil conservation, *Drainage, Overland flow, Erosion, Rainfall intensity, Rainfall disposition, Graphical analysis, Maps. Identifiers: Soil loss.

The rainfall erosion index in the Universal Soil-Loss Equation was intensively studied using an analytic approach. Simplified procedures for its computation were developed and presented. The methodology ties together the eastern and western portions of the United States and is based primarily upon the rainfall distribution curves as published by the Soil Conservation Service and secondarily upon the kinetic energy and rainfall in-tensity relationship. With this improvement the Soil-Loss Equation may become truly 'universal.'
(Yang-ISWS)
W74-12321

MEASUREMENTS OF SAND TRANSPORT BY WIND ON A NATURAL BEACH,

For primary bibliographic entry see Field 2L. W74-12334

ATLANTIC CONTINENTAL SHELF AND SLOPE OF THE UNITED STATES--SEDIMENT TEXTURE OF THE NORTHEASTERN PART, Geological Survey, Washington, D. I. Schlee

J. Scinee. Available from Sup Doc, GPO, Washington, DC 20402, Price \$4.05 including plates. Professional Paper 529-L, 1973. 64 p, 39 fig, 6 plate, 154 ref.

Descriptors: *Bottom sediments, *Continental shelf, *Atlantic Ocean, Distribution patterns, Sediment sorting, Sedimentology, Provenance, Particle size, Marine geology, *Northeast U.S.

The Atlantic continental margin of the northeastern United States is covered by fine to medium quartzone sand out to the shelf edge and by silt and clay on the continental slope and rise. On the glaciated part of the continental shelf (Gulf of Maine), sediment is mainly till-like mixtures of sand, gravel, silt, and clay; in basins of the gulf, pelagic silty clay covers older glacial deposits. Adjacent to the rocky shelf around Nova Scotia, coarse gravel is prevalent. The southern limit of glaciation is marked by a fringe of gravelly sand (former outwash deposits) and sandy gravel. The shelf south of the glacial limit is mainly a sandcovered plain transected by wide channels carved by a dendritic drainage pattern. Relict terraces in-herited from lower stands of sea level are also prevalent in this area, particularly on the outer shelf. Sandy debris has been redistributed so widely over Georges Bank and the inner shelf elsewhere, that the channelways for glacial melt water are now buried. Fine-grained sediment on the shelf is mostly confined to inshore areas such as estuaries, bays, and sounds. The bathymetric transition to the deep sea is marked by a change to finer grained sediment on the continental slope. The sand fraction lessens and changes from dominantly quartz and feldspar to mainly Foraminifera tests. (Knapp-USGS) W74-12337

COASTAL - ESTUARINE AND NEARSHORE PROCESSES, AN ANNOTATED BIBLIOG-RAPHY,

Ocean Engineering Informaton Service, La Jolla, Calif. For primary bibliographic entry see Field 2L.

EFFECTS OF SUSPENDED SILT ON DIS-SOLVED PHOSPHORUS LEVEL IN THE GAL-LATIN RIVER,
Montana State Univ., Bozeman. Dept. of Plant

and Soil Science For primary bibliographic entry see Field 5B. W74-12361

THE BOSPORUS,

W74-12351

Stanford Research Inst., Irvine, Calif. For primary bibliographic entry see Field 2L. W74-12372

ROLE OF THE BOSPORUS IN BLACK SEA CHEMISTRY AND SEDIMENTATION,
Pennsylvania State Univ., University Park. Dept. of Geosciences. For primary bibliographic entry see Field 2L. W74-12373

EXPEDITION 'ODYSSEUS 65': RADIOCARBON AGE OF BLACK SEA DEEP WATER,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla. For primary bibliographic entry see Field 2E. W74-12374

EVOLUTION OF ANOXIC CONDITIONS IN BLACK SEA DURING HOLOCENE, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5B.

DISTRIBUTION OF SOME TRACE ELEMENTS IN BLACK SEA AND THEIR FLUX BETWEEN DISSOLVED AND PARTICULATE PHASES, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5B. W74-12376

PHOSPHORUS IN BLACK SEA, Fishery Board of Sweden, Gotenburg. Hydrographic Dept. For primary bibliographic entry see Field 5B. W74-12377

RELATION BETWEEN CHLORINITY AND CONDUCTOMETRIC SALINITY IN BLACK SEA WATER, Kiel Univ. (West Germany). Institut fuer Meereskunde. For primary bibliographic entry see Field 2K.

INTERSTITIAL WATERS OF BLACK SEA SEDIMENTS: NEW DATA AND REVIEW, Geological Survey, Woods Hole, Mass. For primary bibliographic entry see Field 2K. W74-12379

RECENT SEDIMENTS OF BLACK SEA, Woods Hole Oceanographic Institution, Mass. D. A. Ross, and E. T. Degens. D. A. Koss, and E. 1. Degens.
In: The Black Sea-Geology, Chemistry, and
Biology; Degens, E.T., and Ross, D.A., editors:
American Association of Petroleum Geologists,
Tulsa, Oklahoma, Memoir 20, p 183-199, 1974. 11
fig, 1 tab, 46 ref. NSF Grant GA-1659.

Descriptors: *Sedimentation, *Density stratifica-tion, *Sedimentation rates, Pleistocene epoch, Bottom sediments, Water chemistry, Sulfides, Salinity Identifiers: *Black Sea.

The deep-water sediments deposited during the last 25,000 years in the Black Sea are distinguished by three sedimentary units: unit 1--carbonate-rich microlaminated sediment, deposited within the last 3.000 years; unit 2--organic-rich last 3,000 years; unit 2--organic-rich microlaminated sediment commonly about 40 cm thick, deposited between 3,000 and 7,000 years B.P. and unit 3--alternately light and dark lutite, deposited between 7,000 and at least 25,000 years B.P. Generally, the sedimentation rates ranged from about 40 to 90 cm/1,000 years during the deposition of unit 3, and averaged about 10 cm/1,000 years during the deposition of units 1 and 2. These changes in sedimentation rate coincide 2. These changes in sedimentation rate coincide with major changes in the environmental conditions of the Black Sea. Unit 3 was deposited during a period when the Black Sea was changing (because of Pleistocene sea-level changes) from a marine to a freshwater aerobic lake. At about 9,000 years B.P. and continuing to 7,000 years B.P., seawater occasionally spilled over the Bosporus and entered the Black Sea. The entrance of this water began the change from the freshwater well-aerated phase to the marine stagnant phase. At about 7,000 years B.P. the H2S zone was well established in the deep basin, and deposition of unit 2 began there. On the basis slope the deposition of unit 2 began about 6,200 years B.P., because of the rising H2S-oxygen boundary. Sedimentation rates dropped as a result of rising sea level in the Black Sea which permitted river-carried sediment to be trapped in the estuaries or on the shelf. About 3,000 years ago the conditions that presently characterize the Black Sea were reached. (Knapp-USGS) W74-12380

MINERALOGY AND PETROLOGY OF BLACK SEA BASIN SEDIMENTS, Heidelberg Univ. (West Germany). Sediment

Heidelberg U Research Lab.

G. Muller, and P. Stoffers.

In: The Black Sea-Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A. editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 200-248, 1974. 22 fig, 10 tab, 40 ref, append.

Descriptors: *Sedimentation. *Provenance. Pleistocene epoch, Sea water, Bottom sediments, Mineralogy, Sands, Carbonates, Mud, Clay minerals, Sedimentology. Identifiers: *Black Sea

The origin and modes of transportation and deposition of inorganic sedimentary material of the Black Sea were studied in approximately 60 cores. The sediment derived from the north and northwest (especially from the Danube) has a low calcite-dolomite ratio and a high quartz-feldspar ratio. Rock fragments are generally not abundant; garnet is the principal heavy mineral and illite is the predominant clay mineral. Sediment carried by Anatolian rivers is characterized by a high calcite-dolomite ratio and a low quartz-feldspar ratio.

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Rock fragments are abundant; pyroxene is the principal heavy mineral and montmorillonite is the predominant clay mineral. Clay content increases from the coasts toward two centers in the western and eastern Black Sea basin. Illite is the most com-mon clay mineral. In almost all cores, a rhythmic change of the montmorillonite-illite ratio with depth was observed. These changes may be re-lated to the changing influence of the two provinces during the Holocene and late Pleistocene. The carbonate content of the contemporary sediments ranges from 5% to 65%. It increases from the coast to a maximum in two cen-ters in the western and eastern basin. The contemporary mud sedimentation is governed by two important factors: (1) the deposition of terrigenous allochthonous material of low carbonate content originating from the surrounding hinterland (northern and southern source areas), and (2) the autorthern and southern source areas), and (2) the autorthhonous production of large quantities of biogenic calcite by coccolithophores during the last period of about 3,000-4,000 years. (Knapp-USGS) W74-12381

MODERN SEDIMENTATION IN BLACK SEA,

Akademiya Nauk SSSR, Gelendzhik. Institut Okeanologii.

anoiogi.
K. M. Shimkus, and E. S. Trimonis.
In: The Black Sea--Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 249-278, 1974. 16 fig, 23 tab, 62 ref.

escriptors: *Bottom sediments, *Particle size, *Mineralogy, *Sedimentology, Provenance, Distribution patterns, Sediment sorting, Kaolinite, Illite, Montmorillonite. Identifiers: *Black Sea.

The deep-water sediments of the Black Sea are mainly fine grained; coarse material is found locally on the basin slope and deeper areas, espe cially in the southeastern part of the basin. The latter accumulation is material deposited by turbidity currents. There is a grain-size differentia-tion of clay minerals; kaolinite occurs nearer the coasts; montmorillonite and illite are more common in the deeper areas. The grain size and mineral distribution are controlled by many facmineral distribution are controlled by many factors, including inflow of terrigenous material, original size of source material, production of biogenic carbonate, action of currents, and redeposition by slumping and turbidity currents. (Knapp-USGS) W74-12382

SOME CHARACTERISTICS OF CARBONATE SEDIMENTATION IN BLACK SEA,

Akademiya Nauk SSSR, Gelendzhik. Institut Oke-

anologii.

In: The Black Sea--Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 279-295, 1974. 10 fig, 3 tab, 28 ref.

Descriptors: *Deposition(Sediments), *Sedimentation, Carbonates. Limestones. Suspended load, Chemical precipitation.
Identifiers: *Black Sea.

About 10.8 million tons per year of detrital car-bonate material is brought into the Black Sea in suspension by rivers; more than 25 million tons is carried in solution. In addition, authigenic carbonates, principally mollusk shells and coccoliths, are formed within the Black Sea. The grain-size of carbonate sediments varies as a function of composition and origin. Carbonate material consists mainly of low-magnesium calcite and aragonite. Biogenic prosesses are the major factor in modern carbonate sedimentation. Terrigenous carbonate material also is significant in the general process of carbonate sedimentation. (Knapp-USGS)

W74-12383

GRADED BEDDING IN RECENT BLACK SEA TURBIDITES: A TEXTURAL APPROACH, Institutul Geologic, Bucharest (Rumania).

D. C. Jipa.
In: The Black Sea--Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists Tulsa, Oklahoma, Memoir 20, p 317-331, 1974, 18

Descriptors: *Bottom sediments, *Turbidity currents, *Sediment sorting, *Particle size, rents, *Sediment sorting, *Particle size, *Sediment transport, Density currents, Sedimentation, Deposition(Sediments), Currents(Water), Stratigraphy.
Identifiers: *Black Sea.

Several types of graded bedding are recognized in sediments collected from the central Black Sea. The grading types, matrix content, grain-size distribution, and pulsations in the vertical size dis-tribution provide data on the dynamics of the turbidity currents that deposited these sediments. Several features indicate that the evolution of the sedimentation process of the Black Sea graded beds was governed mainly by the decreasing energy of the transporting turbidity currents. This conclusion is substantiated by: (1) the decreasing content of sand toward the top of the bed and the increasing content of fine-sized particles; (2) increasing percentage of a population representing the increasing importance of the suspended load versus bed load; and (3) matrix size grading and the increasing percentage of matrix present toward the top of the bed. (Knapp-USGS) W74-12384

MASS PHYSICAL PROPERTIES OF SOME

WESTERN BLACK SEA SEDIMENTS, National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and Meteorological Lab.

G. H. Keller

In: The Black Sea-Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 332-337, 1974. 4 fig, 15 ref

Descriptors: *Bottom sediments, *Organic matter, *Sedimentology, Density stratification, Sampling, Stratigraphy, Provenance, Sedimentation. Identifiers: *Black Sea, Sapropels.

Three distinct and unusual sedimentary units can be traced over large parts of the Black Sea basin. These units extend at least through the cored interval (2 m) and they have mass physical properties distinct from those of other marine sediments. On the abyssal plain, the uppermost unit (0-18 cm) consists of alternate microlaminated layers of coccolith and sapropelic mud characterized not only by its composition, but by its high carbonate content (44-81 percent) and intermediate specific gravities of grains (2.19-2.47). The underlying unit (18-62 cm) is composed of highly organic material with properties more closely related to those of peat than those of deep-sea sediments. Water content as high as 700 percent, porosities of 95 per-cent, unit weights as low as 1.07 g/cc, and grain specific gravities of 1.89-2.33 typify this unusual deposit. Unit 3 (62 cm to bottom of cored interval) is characterized by light- and dark-gray silty clay, relatively high specific gravities of grains (2.57-2.74), and remarkably low shear strengths (10-38 g/cc) weights (1.25-1.50 g/cc). (Knapp-USGS) W74-12385

BOTTOM PHOTOGRAPHS OF BLACK SEA, Woods Hole Oceanographic Institution, Mass.

A. C. Vine. In: The Black Sea--Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 338-346, 1974. 11 fig. 7 ref

Descriptors: *Bottom sediments, *Photography, Sedimentology, Sedimentation, Sedime Sedimentary Identifiers: *Black Sea, *Underwater photography.

Bottom photographs from six locations in the anaerobic deep central parts of the Black Sea show no marine life or evidence of bottom activity marine life, but they do show considerable evidence of small debris. Most of the bottom appears mottled, suggesting a closely spaced, uniformly random grouping of small sediment dumps. Some photographs show slight patterns, ranging from a few centimeters to 1 m long, that perhaps result from the descent to the bottom of floating debris, vegetation, or dead marine life. Several different types of lineal patterns on the bottom indicate the action of weak bottom cur-rents. Stereo photos show two lineal-type patterns with no observable relief. These patterns presumably are due to differences in reflective power or to very small textural changes. (Knapp-USGS) W74-12386

GEOCHEMISTRY OF SEDIMENTS FROM ELEVEN BLACK SEA CORES, Durham Univ. (England). Dept. of Geochemistry.

D. M. Hirst.

In: The Black Sea-Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 430-455, 8 tab, 58 ref, append. NSF Grant GA-1659.

Descriptors: *Geochemistry, *Bottom sediments. Statistics, Sampling, Cores, Clay minerals, Provenance, Carbonates, Stratigraphy, Organic matter, Silicates, Sulfur, Sulfides. Identifiers: *Black Sea, *Factor analysis.

The interrelations among 25 chemical variables in 172 samples of Black Sea sediments were assessed by means of factor analysis. The main variance is controlled by the relative amounts of silicate phases, carbonate, organic carbon, and sulfur in the sediments, and is related to the Eh and pH of the depositional environment. Part of the variance is ascribed to variation in the clay mineralogy and is related to a southern and southwestern provenance for chlorite and montmorillonite. Trend-surface analyses of factor scores indicate both areal and stratigraphic variations in the chemistry, which are notable on the bipolar car-bonate-silicate factor and the factor containing loadings for carbon and related elements. Both carbonate and organic carbon are relatively concentrated in sediments from the central Black Sea. particularly in the upper most 100-200 cm of the cores. A threefold stratigraphy comprises a thin recent carbonate sequence overlying sapropelic muds, which in turn overlie more normal lutite. This stratigraphy is recognized most easily in cores from the central Black Sea. Near the southern margin, it is obscured by a high rate of accumulation of detrital silicates; in the eastern Black Sea, deposition of turbidites produces non-standard sequences. (Knapp-USGS) W74-12387

INFLUENCE OF ORGANIC MATERIAL AND PROCESSES OF SULFIDE FORMATION ON DISTRIBUTION OF SOME TRACE ELEMENTS IN DEEP-WATER SEDIMENTS OF BLACK

Akademiya Nauk SSSR, Moscow, Institut Okeanologii. For primary bibliographic entry see Field 2K.

W74-12388

Group 2J-Erosion and Sedimentation

OPCANIC ANALYSES OF BLACK SEA CORES. California Univ., Berkeley. Space Sciences Lab B. R. Simoneit.

B. R. Simonen.
In: The Black Sea-Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 477-498, 1974. 11 fig, 11 tab, 25 ref. NASA Grant NGL-05-003-003.

Descriptors: *Organic matter, *Bottom sediments, Organic compounds, Cores, Sampling, Chemical

Identifiers: *Black Sea, Sapropels

Samples from three Black Sea coring sites (1461, 1462, and 1474) were analyzed for their solventsoluble organic matter. The organic carbon content of these samples ranges from less than 1 percent to about 20 percent; significant amounts of carbonate, terrigenous clays, and terrestrial organic detritus are present. Up to 2.5 percent of the samples is solvent extractable, and the extracts consist mainly of carboxylic acids and hydrocarbons, some with large amounts of elemental sul-fur. The hydrocarbons consist of mainly normal altur. In enydrocarbons consist of mainly normal al-kanes, isoprenoidal hydrocarbons-mainly phytadienes, phytane, and pristane; and a series of isoalkanes. In the high-resolution mass spec-trametric and GC/MS data, there also were indicanoidal compounds. The carbon-rich sample from the 40-cm level at site 1461 yielded an extract consisting mainly of sterols and fatty acids. Its hydrocarbon content is predominantly olefinic alanes and polycyclic material. (Knapp-USGS) W74-12389

FORMS OF IRON IN SURFACE LAYER OF

BLACK SEA SEDIMENTS, Akademiya Nauk SSSR, Moscow. Institut Oke-

A. G. Rozanov, I. I. Volkov, and T. A. Yagodinskaya.

His: The Black Sea-Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 532-541, 1974. 4 fig, 2 tab, 12 ref.

*Bottom Descriptors: *Iron. sediments. *Geochemistry, Oxidation, Reduction(Chemical), Organic matter, Dissolved oxygen, Pyrite, Sulfides, Hydration. Identifiers: *Black Sea

Early diagenesis of iron under oxidizing and reducing conditions in sediments of the Black Sea was studied in detail. Generally, reactive iron in sediments increases in the direction from the coastal areas to the center of the sea. The mineral forms of reactive iron (hydrates, silicates, sulfides) are strongly affected by the kind and amount of organic matter in the sediments. Reducing conditions exist not only in sediments of the deep basin but with exception of the upper few centimeters, they also are present in shallow-water sediments which are laid down under oxidizing conditions. (Knapp-USGS)

MOLVBDENUM REHAVIOR OF PROCESSES OF SEDIMENT FORMATION AND DIAGENESIS IN BLACK SEA,

Akademiya Nauk SSSR, Gelendzhik. Institut Oke-

M. F. Pilipchuk, and I. I. Volkov.

In: The Black Sea-Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 542-553, 1974. 8 fig. 4 tab, 44 ref.

Descriptors: *Molybdenum, *Bottom sediments, *Oxidation-reduction potential, Distribution patterns, Sulfides, Dissolved oxygen, Geochemistry, Diagenesis, Adsorption, Chemical precipitation. Identifiers: *Black Sea, Sapropels. In the Black Sea the distribution of molybdenum is markedly affected by redox reactions. Sediments deposited under oxidizing conditions can scavenge molybdenum by coprecipitation with manganese oxides and hydroxides. In contrast, the high molybdenum content in sediments of the H2S zone can be attributed to the diagenetic fixation of molybdenum to organic matter and also to incor-poration of molybdenum in pyrite. Enrichment of molybdenum during the lifetimes of planktonic organisms is not significant in accounting for the high concentrations of this element in the organicrich sediments. (Knapp-USGS) W74-12391

ISOTOPIC AND ELEMENTAL GEOCHEMIS-

TRY OF BLACK SEA SEDIMENTS, Bureau of Mineral Resources,

(Australia).

J. A. Cooper, E. J. Dasch, and M. Kaye. In: The Black Sea-Geology, Chemistry, and Biology; Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 554-565, 1974. 7 fig. 6 tab. 34 ref.

Descriptors: *Rottom sediments *Provenance *Geochemistry, Radioisotopes, Stable isotopes, Strontium radioisotopes, Lead radioisotopes. Identifiers: *Black Sea.

In the Black Sea, sediment provenance approximates average continental material. Except for basaltic rock, sediment sources for the Black Sea are extremely varied, both lithologically and temporally. Thus, excluding variations in trace eleporany. Thus, excluding variations in trace ele-ments, the chemistry of Black Sea sediment on a carbonate-free basis closely approaches values for an average cratonic shale. Varied continental provenance also is defined by lead-isotope ratios, which are closer to numbers obtained from crustal rock than from oceanic-basaltic, more deeply derived rock. Additionally, strontium-isotope composition of the sediments reflects moderately radiogenic sources; the range and average for the Black Sea Sr ratios are close to those of deep-sea detritus from the western North Atlantic. (Knapp-USGS) W74-12392

QUANTIFICATION OF SHORELINE MEAN-DERING, Virginia Univ., Charlottesville. Dept. of Environ-

mental Sciences. L. Vincent.

Available from NTIS, Springfield, Va. 22161 as AD-773 050, Price \$4.00 printed copy, \$2.25 microfiche. Technical Report No 7 for Office of Naval Research, Geography Programs, November 1973. 89 p, 16 fig, 18 tab, 6 append. ONR Nonr-N00014-69-A-0060-0006.

Descriptors: *Meanders, *Beaches, *Sand waves, Topography, Geomorphology, Statistical models, Water circulation, Littoral drift, Beach erosion, Waves(Water), Surf, *North Carolina. Identifiers: *Hatteras Island(NC).

Rhythmic shoreline topography, termed shoreline meandering, was investigated along Hatteras Island, North Carolina, using aerial photography. Two types of meanders were distinguished on the basis of form geometry. The temporal and spatial variabilities of meandering were quantified using spectral and multivariate techniques. In a model of the beach cycle in the nearshore zone, the occur-rence of small meanders is a function of storm-current velocity, nearshore slope, and a poststorm balance of onshore and offshore sand transport (due to the presence of topography-forced nearshore circulation). The model explains the observed characteristics of small, rhythmic meanders. Large meanders are explained as regions of over long, offshore shoals. (Knapp-USGS) W74-12643 severe storm erosion caused by wave convergence

PARTICLE SIZE DISTRIBUTION AND SMALL-SCALE BED-FORMS ON SAND WAVES, CHES-APEAKE BAY ENTRANCE.

Dominion Univ., Norfolk, Va. Inst. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-12650

EROSION AND SEDIMENT YIELDS IN MOUN-EROSION AND SEDIMENT YIELDS IN MOUN-TAIN WATERSHEDS OF THE TRANSVERSE RANGES, VENTURA AND LOS ANGELES COUNTIES CALIFORNIA--ANALYSIS OF RATES AND PROCESSES, Geological Survey, Menlo ark, Calif. K. M. Scott, and R. P. Williams. Water-Resources Investigations 47-73, June 1974.

66 p, 12 fig, 8 tab, 54 ref.

Descriptors: *Erosion, *Sediment yield, *California, *Mass wasting, Sedimentation, Alpine, Mountains, Geology, Geomorphology, Topography, Slopes.
Identifiers: *Transverse Ranges(Calif).

Erosion rates in mountain watersheds of the western Transverse Ranges of Ventura County, California, range from very low values to values as high as those recorded anywhere for comparable bedrock erodibilities. A major reason for this ex-treme variability is the high degree of tectonic actrivity in the area--watersheds are locally being uplifted by at least as much as 25 feet per 1,000 years. The maximum extrapolated rate of denudation is 7.5 feet per 1,000 years. Evidence of large amounts of uplift continuing into historic time inamounts or upint continuing into historic time in-cludes structurally overturned strata of Pleistocene age, active thrust faulting, demonstra-ble stream antecedence, uplifted and deformed terraces, and other results of base-level change seen in stream channels. The importance in the area of debris flows, mudflows, and mass move-ments is also a reflection of the active tectonic setting of the Transverse Ranges. Lateral supply of sediment to stream channels is a relatively tinuous process, accomplished during the dry season by dry sliding, in addition to wet-season contributions from overland flow and mass movements. During periods without major storms, stream channels undergo continuous fill. Then, during a storm of high recurrence interval, channel-bed material is mobilized and dispersed in large part by debris flows--coarse granular slur-ries, some of which are induced by mass movements triggered by the storm. Channels undergo substantial net scour, accomplished by removal of bed material in debris flows and by scour during recession flow. Valley-side slopes are undercut by bank erosion, and a new cycle of channel infilling by hillslope processes is initiated. (Knapp-USGS) W74-12652

SAND GULLYING IN A SAHELIAN SITE: OB-SERVATIONS DURING RECENT RAINFALL IN THE NOUAKCHOTT REGION (MAURITANIA), Institut Fondamental d'Afrique Noire, Dakar (Senegal). Dept. of Geography.
For primary bibliographic entry see Field 4D.

THE LACK OF INORGANIC REMOVAL OF DISSOLVED SILICA DURING RIVER-OCEAN MIXING,

University of South Florida, St. Petersburg. Marine Science Inst. For primary bibliographic entry see Field 5G.

OBSERVATIONS OF THE ORGANIC COM-PONENTS OF THERMAL MUDS: III. THE LIPID FRACTIONS OF THE LACCO AMENO (ISCHIA) PELOIDS, (IN ITALIAN),

Rome Univ. (Italy). Istituto di Terapia Medica Sistematica e Idrologia Medica. A. Rigoli, E. Fedeli, S. B. Curri, N. Cortesi, and G.

Chemical Processes—Group 2K

Biochim Biol Sper. Vol 10, No 1, p 39-50. 1971/1972. Illus. (English summary). Identifiers: *Chromatography, *Italy, Lipids, *Muds, *Thermal properties, Organic matter.

In follow-up investigations on the lipidic composition of muds of different Italian thermal baths, the acetone soluble lipid fraction and the total lipids extracted from a mud sample from Lacco Ameno (Ischia, Italy) after Folch's method were studied (Ischia, Italy) after Folch's method were studied by thin layer and gas-liquid chromatography (GLC). They consisted of 32.9% phospholipids and pigments (carotenoids), 24.1% triglycerides, 12.1% di- and monoglycerides, 18% hydrocarbons C30-C38, 6.7% sterols, 4.4% free fatty acids and 1.8% alcohols and terpenes. The presence of cholesterol (20.5%), beta-sitosterol (30%), stigmasterol (15.3%), campesterol (7.5%) and an unknown sterol (26.7%) was verified. The triterpenic alcohols were alpha- and beta-amyrine (74.3%), cycloarthanol (15.8%) and 24cycloarthanol (15.8%) and 24-methylenecycloarthanol (9.9%). The maturationtechnique carried out in Ischia was questioned .--Copyright 1973, Biological Abstracts, Inc. W74-12739

2K. Chemical Processes

ECOLOGY AND ANALYSIS OF TRACE CON-TAMINANTS - PROGRESS REPORT, JANUARY 1973-SEPTEMBER 1973.

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-12021

HYDROLYTIC BEHAVIOR OF TOXIC METALS.

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-12027

DEVELOPMENT OF HIGH SENSITIVITY X-RAY FLUORESCENCE FOR ANALYSES OF TRACE TOXIC ELEMENTS,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12028

W74-12029

ENVIRONMENTAL APPLICATIONS OF CENTRIFUGAL PHOTOMETRIC ANALYSIS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A.

SEPARATION, DETECTION, AND IDENTIFICATION OF ORGANICALLY BOUND TOXIC METALS AND OTHER HAZARDOUS MATERI-ALS.

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12030

MEASUREMENT OF MOLECULAR ORGANIC CONTAMINANTS IN POLLUTED WATER BY LIQUID CHROMATOGRAPHY,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A.

RAPID 15-N ISOTOPIC-RATIO ANALYTICAL SYSTEM FOR ENVIRONMENTAL SAMPLES, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12032

WATER RESOURCES OF THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C.

W74-12056

WATER QUALITY AND RELATED STUDIES, JACKSONVILLE AREA, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5B. W74-12077

SOLMNEO: SOLUTION-MINERAL EQULIBRI-

UM COMPUTATIONS, California Univ., Berkeley. Dept. of Geology and Geophysics.

Y. K. Kharaka, and I. Barnes

Y. K. Kharaka, and I. Barnes. Available from NTIS, Springfield, Va 22161 as PB-215 899 Price \$3.00 printed copy; \$2.25 microfiche. Geological Survey Computer Con-tribution (USGS-WRD-73-002), February 1973. 82 p, 2 tab, 51 ref, 5 append. USGS Grant 14-08-0001G-45.

Descriptors: *Computer programs, *Water chemistry, *Equilibrium, *Mineraology, Solubility, Water analysis, Chemical analysis, Water temperature, Hydrogen ion concentration, Oxidation-reduction potential, Thermodynamics, Ions, Aqueous solutions.

A computer program (SOLMNEQ) computes the equilibrium distribution of 162 inorganic aqueous species generally present in natural waters over the temperature range of 0 deg to 350 deg C from reported chemical analyses, temperature, pH, and Eh. Interpolated dissociation constants of the aqueous complexes and computed activity coefficients are also used in these computations. States of reactions of aqueous solutions with respect to 158 solid phases (minerals) are computed from the distribution of aqueous species and an internally consistent set of thermodynamic data. Ionic proportions and subsurface temperature estimates are also computed. The program is written in PL/I for the IBM 360 computer. (Knapp-USGS)

PHOTOIONIZATION OF PHENOLS IN WATER: EFFECTS OF LIGHT INTENSITY, OXYGEN, PH, AND TEMPERATURE, Hebrew Univ., Jerusalem (Israel). Dept. of Physi-

cal Chemistry.
For primary bibliographic entry see Field 5B. W74-12169

DETERMINATION OF TRACE METAL POLLU-TANTS IN WATER RESOURCES AND STREAM SEDIMENTS, Dayton Univ., Ohio.

For primary bibliographic entry see Field 5A. W74-12194

PROCEEDINGS, SYMPOSIUM ON CONTROL OF FINE PARTICULATE EMISSIONS FROM INDUSTRIAL SOURCES.

For primary bibliographic entry see Field 5A. W74-12208

COMPARISON OF GERMANIUM DETECTORS FOR NEUTRON ACTIVATION ANALYSIS FOR MERCURY.

Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab. For primary bibliographic entry see Field 5A. W74-12220

AN IMPROVED METHYLTHYMOL BLUE PROCEDURE FOR AUTOMATED SULFATE DETERMINATION,

R. J. Watrous, and J. E. Douglass.
Analytical Chemistry, Vol 46, No 9, p 1329-1331,
August, 1974. 2 fig. 2 ref. *Interagency Agreement
AG-199, 40-193-69.

Descriptors: *Sulfates, *Water analysis, Chemical analysis, *Water chemistry, Runoff, Chemistry of precipitation.

Former methods of determining sulfate in stream-flow and precipitation on the AutoAnalyzer II were typically noisy and plagued with shifting baselines. The new method proved accurate, easy to maintain in operation, and sensitive to concentrations in the 0-10 mg/l range. The increased sensitivity was achieved by using a 50-mm flow cell, maintaining a higher flow rate to the colorimeter by the addition of ethanol to the sample stream, and maintaining a low flow cell extraction rate. Detection limits for the procedure were better than 0.020 mg/1, and the percentage accuracy in the 0-1.0 mg/1 range was 1.7 percent error. W74-12228

FINE STRUCTURE OF LIGHT ATTENUATION AND ITS RELATION TO TEMPERATURE IN THE IRISH SEA,

University Coll. of North Wales, Menai Bridge. Marine Science Labs.

D. C. Heathershaw, and J. H. Simpson. Estuarine and Coastal Marine Science, Vol 2, No 2, p 91-103, 1974. 9 fig, 12 ref.

Descriptors: *Sea water, *Salinity, *Optical properties, *Thermal stratification, On-site tests, Light intensity, Aquatic environment, Light, Evaluation, Attenuation, Temperature, Thermocline. Water properties.

Identifiers: *Irish Sea, Transmittance gradient.

Detailed observations of optical beam transmittance were made in a stratified region of the Irish Sea. The distribution of transmittance was found to be strongly influenced by the temperature structure, significant gradients of both parameters frequently occurring together. Strong minima in transmittance with a horizontal length scale of kilometres were observed in the thermocline. A steady state vertical diffusion model was applied to the data below the thermocline, giving values of the eddy coefficient in this region of 1-6 sq cm. (Humphreys-ISWS) W74-12279

THE ROLE OF OXYGEN IN NITROGEN LOSS FROM FLOODED SOILS,

Louisiana State Univ., Baton Rouge For primary bibliographic entry see Field 2G. W74-12290

DETERMINATION OF DISPERSION AND NON-LINEAR ADSORPTION PARAMETERS FOR FLOW IN POROUS MEDIA,

Purdue Univ., Lafayette, Ind. School of Chemical Engineering. For primary bibliographic entry see Field 2G. W74-12299

EXPERIMENTAL EVALUATION OF CHEMI-CAL TRANSPORT IN WATER-SATURATED POROUS MEDIA: 1. NONSORBING MEDIA, Oregon State Univ., Corvallis. Dept. of Soil Oregon State Univ., Corvallis. Dept. of Soil Science.; and Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry. For primary bibliographic entry see Field 2G. W74-12306

SORPTION OF ORTHOPHOSPHATE ON THE SURFACE OF WATER SAMPLE CONTAINERS, Agricultural Research Service, Morris, Minn. For primary bibliographic entry see Field 5A. W74-12307

THE ABSORPTION OF LOW CONCENTRA-TIONS OF SULPHUR DIOXIDE INTO AQUE-OUS SOLUTIONS, Auckland Univ. (New Zealand). Dept. of Chemis-

Group 2K—Chemical Processes

For primary bibliographic entry see Field 5B. W74-12311

THE SOLUBILITY OF VERY LOW CONCEN-TRATIONS OF CARBON MONOXIDE IN AQUEOUS SOLUTION,

Auckland Univ. (New Zealand). Dept. of Chemis-For primary bibliographic entry see Field 5B.

ON THE ABSORPTION OF SO2 IN OCEAN WATER,

Frankfurt Univ. (West Germany). Institut fuer Meteorologie und Geophysik. S. Beilke, and D. Lamb.

Tellus, Vol 26, No 1-2, p 268-271, 1974. 4 fig, 6 ref.

Descriptors: *Absorption, *Sulfur compounds, *Gases, *Ocean water, *Sorption, Oxides, Hydrogen sulfide, Sea water, Chemical properties, Sulfur, Solubility, Water analysis, Analytical techniques, Sulfates, Sulfides, Inorganic compounds Sinks pounds, Sinks.

Identifiers: Sulfur dioxide, Desorption, Bubble column experiments, Source, Buffer capacity, Liquid phase, Gas phase, Atmospheric sulfur budget, Terrestrial sulfur budget.

The role which the ocean plays with respect to the atmospheric sulfur budget is unclear. It is known that the ocean is an important source of sulfate-containing particles, but opinions differ on the question: Is the ocean a sink or a source of SO2 and H2S. On the basis of laboratory investiga-tions, the absorption and desorption of SO2 by sea water was discussed. The results of measurements show that the ocean is an SO2 sink and presumably cannot be a direct SO2 source. The possibility of an indirect source of SO2 was considered in a discussion of current literature on H2S-oxidation in ocean water. (Henley-ISWS) W74-12320

WATER RESOURCES OF WISCONSIN, LAKE

SUPERIOR BASIN, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-12335

RESOURCES OF WISCONSIN-WATER MENOMINEE-OCONTO-PESHTIGO BASIN.

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-12336

EFFECTS OF CLEAR CUTTING ON WATER DISCHARGE AND NUTRIENT LOSS, BITTER-ROOT NATIONAL FOREST, MONTANA, Montana Univ., Missoula. Dept. of Geology. For primary bibliographic entry see Field 5B. W74-12359

EXPEDITION 'ODYSSEUS 65': RADIOCARBON AGE OF BLACK SEA DEEP WATER, Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.

For primary bibliographic entry see Field 2E. W74-12374

EVOLUTION OF ANOXIC CONDITIONS IN BLACK SEA DURING HOLOCENE, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5B. W74-12375

DISTRIBUTION OF SOME TRACE ELEMENTS IN BLACK SEA AND THEIR FLUX BETWEEN DISSOLVED AND PARTICULATE PHASES, Woods Hole Oceanographic Institution, Mass

For primary bibliographic entry see Field 5B. W74-12376

PHOSPHORUS IN BLACK SEA,

Fishery Board of Sweden, Gotenburg. Hydro-graphic Dept. or primary bibliographic entry see Field 5B. W74-12377

RELATION BETWEEN CHLORINITY AND CONDUCTOMETRIC SALINITY IN BLACK

SEA WATER, Kiel Univ. (West Germany). Institut fuer Meereskunde. K. Kremling.

In: The Black Sea-Geology, Chemistry, and Biology; Degens, E.T., and Ross, D.A., EDI-TORS: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 151-154, 1974. 2 fig, 2 tab, 10 ref.

Descriptors: *Water chemistry, *Sea water, *Salinity, *Conductivity, Chlorides, Sulfates, Boron, Fluorides, Calcium, Density stratification. Identifiers: *Black Sea, Chlorinity.

The chlorinity and conductometric salinity were determined for Black Sea water collected from 14 A regression line compares the differences between conductometric and titrimetric salinities. The determination of chlorinity from conductometric salinity is only possible to 0.01 percent (at a 70-percent confidence limit), because of the ionic variation of Black Sea water. The chlorinity ratios of sulfate, boron, fluoride, and calcium from water at station 1486 are presented. (Knapp-USGS) W74-12378

INTERSTITIAL WATERS OF BLACK SEA SEDIMENTS: NEW DATA AND REVIEW,

Geological Survey, Woods Hole, Mass. F. T. Manheim, and K. M. Chan.

In: The Black-Sea-Geology, Chemistry, and Biology, Degens, E.T., and Ross, D.A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 155-180, 1974. 13 fig, 12 tab, 86 ref.

Descriptors: *Pore water, *Bottom sediments, *Salinity, *Water chemistry, Chlorides, Sea water, Brines, Alkalinity, Sulfates, Sulfides, Density stratification. Identifiers: *Black Sea.

The composition of pore fluids trapped in the bottom sediments of the Black Sea provides information of geochemical and paleohydrologic aspects of the Black Sea during the Holocene and late Pleistocene Epochs. Most piston cores show a decrease in interstitial chlorinity and salinity with depth. This suggests that during isolation of the Black Sea in the last glacial maximum (Neoeuxinian), the Black Sea had a relatively homogeneous chlorinity of about 3.5 g/kg, compared with more than 12 g/kg in present bottom water. Submarine discharge of fresh to brackish groundwaters occurs in several areas. In addition, a saltier subsediment input near the Bosporus channel is possibly a result of upward diffusion of salts from evaporites or continental brines Diagenetic reactions between pore fluids and sediments result in (1) strong uptake of interstitial potassium and magnesium in nonexchangeable positions in the sediments and (2) loss of sulfate by bacterial reduction. Calcium, bicarbonate alkalinity, decreases with depth in cores, suggesting that both carbonate precipitation and dissolution occur in the deeper sediments. Interstitial waters are the main source of iron, manganese, and phosphorus main source of fron, manganese, and prosphorus for iron-manganese concretions on the oxygenated Crimean shelf. Supply from this source corresponds to a growth rate of 5 mm/1,000 years. (Knapp-USGS) W74-12379 RECENT SEDIMENTS OF BLACK SEA, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 2J. W74-12380

GEOCHEMISTRY OF SEDIMENTS FROM ELEVEN BLACK SEA CORES, Durham Univ. (England). Dept. of Geochemistry. For primary bibliographic entry see Field 2J.

INFLUENCE OF ORGANIC MATERIAL AND PROCESSES OF SULFIDE FORMATION ON DISTRIBUTION OF SOME TRACE ELEMENTS IN DEEP-WATER SEDIMENTS OF BLACK

SEA, Akademiya Nauk SSSR, Moscow. Institut Oke-

anologii.

I. I. Volkov, and L. S. Fomina.

W74-12387

In: The Black Sea-Geology, Chemistry, and Biology, Degens, E. T., and Ross, D. A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 456-476, 1974. 5 fig. 6 tab, 61 ref.

Descriptors: *Geochemistry, *Sulfides, *Trace elements, *Organic matter, Dissolved oxygen, Sorption, Mud, Pyrite, Chemical precipitation, Water chemistry, Molybdenum, Cobalt, Nickel, Copper.
Identifiers: *Black Sea, Sapropels.

The irregular distribution of elements in Black Sea deposits is explained by the geochemical evolution of the basin in postglacial times and is controlled by several factors. Chief among these factors are the change in hydrodynamic regime and the decreasing rate of sedimentation in post-Neoeux-inian time. Subsidiary factors, beginning during Old Black Sea time, include the increasing proportion of organic matter in the sediments; the ap-pearance and stabilization of H2S in bottom water; and the initiation of the Bosporus underflow, which brought Mediterranean water into the Black Sea. Maximum concentrations of Mo, V, Co, Ni, and Cu are found in the sapropelic muds of the Old Black Sea deposits. Cobalt concentrations correlate with sulfide (represented basically by pyrite). Higher concentrations of microelements in the sapropels result from absorption of metals from seawater by organic detritus during settling of the particulates. Accumulation of metals by living planktonic organisms is subordinate. Mo, Co, Ni, and Cu in pyrite from deep-water sediments of the H2S zone were significantly enriched. (Knapp-USGS) W74-12388

ORGANIC ANALYSES OF BLACK SEA CORES, California Univ., Berkeley. Space Sciences Lab. For primary bibliographic entry see Field 2J. W74-12389

FORMS OF IRON IN SURFACE LAYER OF BLACK SEA SEDIMENTS,
Akademiya Nauk SSSR, Moscow. Institut Oke-

anologii.

For primary bibliographic entry see Field 2J. W74-12390

BEHAVIOR OF MOLYBDENUM IN PROCESSES OF SEDIMENT FORMATION AND DIAGENESIS IN BLACK SEA, Akademiya Nauk SSSR, Gelendzhik. Institut Oke-

anologii. For primary bibliographic entry see Field 2J.

W74-12391

ISOTOPIC AND ELEMENTAL GEOCHEMISTRY OF BLACK SEA SEDIMENTS, Bureau of (Australia). Mineral Resources, Canberra

For primary bibliographic entry see Field 2J.

W74-12392

ATOMIC ABSORPTION DETERMINATION OF NANOGRAM QUANTITIES OF ARSENIC IN BIOLOGICAL MEDIA, Washington Univ., Seattle. Dept. of Environmen-

tal Health. For primary bibliographic entry see Field 5A. W74-12479

ANALYSIS OF BACKGROUND COPPER CON-CENTRATION IN SEAWATER BY ELECTRON SPIN RESONANCE,

Kansas State Highway Commission, Topeka. Planning and Development Dept. For primary bibliographic entry see Field 5A.

DETERMINATION OF ZINC AND NICKEL BY CHARGED PARTICLE ACTIVATION ANALY-

Texas A and M Univ., College Station, Dept. of Chemistry. For primary bibliographic entry see Field 5A. W74-12484

DETERMINATION OF MERCURY AND SELENIUM IN COAL BY NEUTRON ACTIVA-

North Carolina State Univ., Raleigh. Dept. of Nuclear Engineering. For primary bibliographic entry see Field 5A. W74-12485

RESPONSE OF CYANIDE ION SELECTIVE MEMBRANE ELECTRODES IN THE PRESENCE OF METAL IONS,

Rome Univ., (Italy). Instituto di Chemica Analitica. For primary bibliographic entry see Field 5A. W74-12489

X-RAY PHOTOELECTRON SPECTRA OF

LEAD OXIDES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W74-12498

ELECTRON SPECTROSCOPY (ESCA): USE FOR TRACE ANALYSIS,

Georgia Univ., Athens. Dept. of Chemistry For primary bibliographic entry see Field 5A.

DETERMINATION OF SOLUBLE CADMIUM, LEAD, SILVER, AND INDIUM IN RAINWATER AND STREAM WATER WITH THE USE OF FLAMELESS ATOMIC ABSORPTION,

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A. W74-12501

LOSSES OF TRACE CONCENTRATIONS OF CADMIUM FROM AQUEOUS SOLUTION DUR-ING STORAGE IN GLASS CONTAINERS, Idaho Univ., Moscow. Dept. of Chemistry For primary bibliographic entry see Field 5A. W74-12502

ARGILLIZATION BY DESCENDING ACID AT STEAMBOAT SPRINGS, NEVADA, Geological Survey, Washington, D.C. R. Schoen, D. E. White, and J. J. Hemley. Clays and Clay Minerals, Vol 22, p 1-22, 1974. 11 fig, 6 tab, 49 ref.

Descriptors: *Water chemistry, *Hot springs, *Acids, Sulfides, Sulfates, Acidic water, Clay

minerals, *Nevada, Mineralogy, Hydrogen ion concentration, Hydrothermal studies. Identifiers: *Steamboat Springs(Nev).

Steamboat Springs, Nevada, an area of present-day hot springs, clearly illustrates the genetic dependence of some kaolin deposits on hot-spring activity. Andesite, granodiorite and arkosic sedi-ments are locally altered at the land surface to siliceous residues consisting of primary quartz and anatase, plus opal from primary silicates. These siliceous residues commonly exhibit the textural and structural features of their unaltered equivalents. Beneath the siliceous residues, kaolin and alunite replace primary silicates and fill open spaces, forming a blanketlike deposit. Beneath the kaolin-alunite zone, montmorillonite, commonly accompanied by pyrite, replaces the primary silicates. On the ground surface, the same alteration mineral zones can be traced outward from the siliceous residue; however, hematite rather than pyrite accompanies montmorillonite. Sulfuric acid is the active altering agent. The acid forms from hydrogen sulfide that exsolves from deep thermal water, rises above the water table and is oxidized water, rises above the water table and is oxidized by sulfur-oxidizing bacteria living most of surface. This acid dissolves and percolates downward, destroying most of the primary minerals to produce a siliceous residue. Coincidence of the water table with the downward transition from siliceous residue to kaolin-alunite signifies decreasing hydrogen metasomatism because of dilution of acid by groundwater. (Knapp-USGS) W74-12651

CLAY WATER INTERACTIONS--AN EXPERI-INTERFACE MENTAL STUDY OF PHENOMENA,

Royal Inst. of Tech., Stockholm (Sweden). Nuclear Magnetic Resonance Group. For primary bibliographic entry see Field 2G. W74-12654

AUTOMATED GAS CHROMATOGRAPHIC ANALYSIS OF SULFUR POLLUTANTS, Varian Aerography, Walnut Creek, Calif. For primary bibliographic entry see Field 5A.

APPLICATION OF THE FISSION-TRACK TECHNIQUE TO THE DETERMINATION OF URANIUM IN NATURAL WATERS, Kyushu Univ., Fukuoka (Japan). Dept. of Chemis-

For primary bibliographic entry see Field 5A. W74-12720

HYDROBIOLOGICAL INVESTIGATIONS IN THE DANUBE SECTION ENCLOSED BETWEEN THE 1965 AND 1956 RIVER KM (NAGYMAROS-MEGYER (DANUBIALIA HUNGARICA LVII),

A. Bothar, Z. T. Dvihally, and E. V. Kozma. Ann Univ Sci Budap Rolando Eotvos Nominatae Sec Biol. 13, p 3-18, 1971. Illus. Identifiers: Alona, Cladocera, Copepods, *Danube River, *Hungary, Iliocryptus, *Algae, Water chemistry, *Plankton, Monospilus.

Year-round zoological and hydrochemical investigations of a selected section of the Danube River revealed no significant differences between the end points of the section studied, and no noteworthy changes in the dissolved salt content and in the pollution level of the water as compared to investigations conducted in previous years. The minor changes observed in the chemical properties of the water were due to variations in hydrological conditions, and in the assimilation activity of algae. Studies of the planktons of this river section revealed 20 Cladocera sp. and 7 Copepoda sp., of which 3 species (Alona guttata, Iliocryptus agilis, and Monospilus dispar) are new for the Hungarian section of the Danube .-- Copyright 1973, Biological Abstracts, Inc. W74-12731

DECOMPOSITION OF NITROGEN COM-POUNDS IN LAKE MUD IN VIEW OF NITROGEN ISOTOPE RATIOS: I. ANALYTI-CAL METHOD FOR NITROGEN COMPOUNDS IN SEDIMENTS.

Yokohama Sewerage Bureau, Kanagawa (Japan).

K. Sakata, and S. Matsuo. Geochem J. Vol 6, No 2, p 49-58. 1972. Illus. Identifiers: *Mud, *Nitrogen, *Lake sediments, Isotopes, Lakes.

The method of chemical separation for N compounds in soils established by Bremner was checked and modified to apply for the measurement of the natural variation in isotopic ratios of N compounds in sediments. Separation of N compounds of N compou pounds in different occurrences (i.e., in interstitial water, in the exchangeable site on the surface of solid, and in solid) was also studied, and the optimum conditions for the separation were determined.--Copyright 1973, Biological Abstracts, Inc.

OBSERVATIONS OF THE ORGANIC COM-PONENTS OF THERMAL MUDS: III. THE LIPID FRACTIONS OF THE LACCO AMENO (ISCHIA) PELOIDS, (IN ITALIAN), Rome Univ. (Italy). Istituto di Terapia Medica Sistematica e Idrologia Medica.

For primary bibliographic entry see Field 2J.

2L. Estuaries

SURFACE-WATER INVESTIGATIONS ON THE LUMMI INDIAN RESERVATION, WASHING-TON.

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 4A. W74-12008

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES, PARTS I AND II,

Geological Survey, Tacoma, Wash. H. B. Fischer, J. D. Stoner, W. L. Haushild, and J. B. McConnell. Open-file report, 1974. 63 p. 22 fig. 3 tab, 22 ref.

Descriptors: *Stratified flow, *Estuaries, *Saline water intrusion, *Mathematical models, *Computer programs, Washington, Mixing, Path of pollutants, Tides, Currents(Water), Saline water-freshwater interfaces. Identifiers: *Duwamish River(Wash).

A mathematical model calculates flow in estuaries. Water in a salt-wedge estuary is characterized by an oscillating well-mixed wedge of undiluted ocean-derived water topped by a series of successively more dilute overlying layers. In the wedge the flow is back and forth, with a net landward component to replace water entrained upward into the overlying layer; in the overlying layers the flow also oscillates, but with a net seaward component because of the input of fresh river water and entrained wedge water. The flow is modeled and used as an input to the constituent-transport model. The computer program then is used to determine the advection and dispersion of dissolved constituents and plankton, and their concentrations throughout the system in response to given inputs. Saltwater from Elliott Bay on Puget Sound, Washington, forms a wedge in the lower part of the Duwamish River estuary. The numeri-cal model was used in computing salinity distributions in the estuary and oxygen-use rates and dissolved-oxygen distributions in the salt wedge. Computed spatial distributions of salinity agreed

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well with observed distributions during about 30 slack tides in July and August 1968. Analyses of stack notes in July and August 1700. Analyses in the sensitivity of computed salinity to changes in model input parameters indicate that it changed most in response to changes in the wedge salinity and the location of the wedge toe. (Knapp-USGS)

NUMERICAL MODEL STUDIES OF RIVERS

AND ESTUARIES, National Research Council of Canada, Ottawa (Ontario). Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-12101

CONTROL OF SEA WATER INTRUSION BY SALTWATER PUMPING--A MATHEMATICAL

MacLaren (James F.) Willowdale (Ontario). For primary bibliographic entry see Field 5G. W74-12102

FORECASTING POLLUTION IN RIVERS, ESTUARIES AND THE SEA, Pollution Research Lab., Stevenage (England).

For primary bibliographic entry see Field 5B. W74-12116

COASTAL MARINE POLLUTION AND FISH. Fisheries Research Board of Canada, West Vancouver, B.C. Pacific Environmental Inst. For primary bibliographic entry see Field 5C. W74-12252

AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER, Univ. of Washington, Seattle. Dept. of Oceanog-

For primary bibliographic entry see Field 5C.

STUDIES ON COPPER, IRON, MANGANESE AND ZINC IN OYSTERS (CRASSOSTREA ANGULATA) ON THE GULF OF CADIZ (ESTUDIOS DEL COBRE, HIERRO, MANGANESO Y CINC EN OSTIONES-CRASSOSTREA ANGULATA-DEL GOLFO DE CADIZ), Lauting de la pregiognose Pesqueras (Cadiz Angulata). Instituto de Investigaciones Pesqueras, Cadiz

For primary bibliographic entry see Field 5C.

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRATION IN THE WESER ESTUARY AND THE GERMAN BIGHT, (DIE MIESMUSCHEL MYTILUS EDULIS ALS INDIKATOR FUR DIE BLEIKONZENTRATION IM WESERASTUAR UND IN DER DEUTSCHEN BUCHT), Institut fuer Meeresforschung, Bremerhaven (West Germann)

For primary bibliographic entry see Field 5B. W74-12265

MODULARIZED SYSTEMS FOR FIELD ANAL-YSIS OF PRIMARY PRODUCTION IN CHES-

APEAKE BAY, Academy of Natural Sciences of Philadelphia, Benedict, Md. Benedict Estuarine Lab. For primary bibliographic entry see Field 5A. W74-12268

FINE STRUCTURE OF LIGHT ATTENUATION AND ITS RELATION TO TEMPERATURE IN

THE IRISH SEA, University Coll. of North Wales, Menai Bridge. Marine Science Labs. For primary bibliographic entry see Field 2K.

W74-12279

METAL DISTRIBUTION ALONG A PROFILE

OF AN INTER-TIDAL AREA, Stockholm Univ. (Sweden). Geological Inst. For primary bibliographic entry see Field 5B. W74-12280

LITHOFACIES RELATIONS IN THE LATE QUATERNARY NIGER DELTA COMPLEX, Koninklijke Shell Exploratie en Produktie Laboratorium, Rijswijk (Netherlands). E. Oomkens.

Sedimentology, Vol 21, No 2, p 195-222, May 1974. 18 fig, 27 ref.

*Deltas, *Quaternary Descriptors: Descriptors: *Dettas, *Quaternary period, *Deposition(Sediments), *Africa, Geomorphology, Coasts, Rivers, Sedimentology, Cores, Boreholes, Evaluation, Stratigraphy, Recent epoch, Marine geology, Investigations.

Identifiers: *Niger River delta, Gulf of Guinea,
Coastal deposits, *Lithofacies.

study of cores from thirty-three coreholes drilled in various parts of the Niger delta has shown tidal channel sand to be the dominant lithofacies type in the uppermost 30 m of the delta-ic complex. Below 30 m fluviatile sand becomes predominant. Coastal barrier sand is present in the uppermost 5 m of the present coastal belt, but chances for preservation of this lithofacies appear to be small. The Post-Glacial deltaic sediments can be divided into three units. (1) Alluvial valley-fill sands and conglomerates deposited during the strong Post-Glacial sea level rise. (2) An onlapping complex of lower coastal plain deposits which contains a lower member of fine grained lagoonal and mangrove swamp deposits and an upper member of tidal channel and coastal barrier sands. This complex is thought to have been deposited during the strong Post-Glacial rise in sea level and is locally as much as 25 m thick. (3) An offlapping complex of fluviomarine and coastal deposits which contains a lower member of marine clay and silt and an upper member of tidal channel and coastal barrier sand. The presence of this late Holocene complex indicates that deltaic progradation was resumed as soon as the rapid rise in sea level slowed down. The offlapping complex is lo-cally as much as 35 m thick. (Humphreys-ISWS) W74-12305

WATER CIRCULATION AND NUTRIENTS IN THE NORTH-WEST IRISH SEA,

Liverpool Univ. (England). Dept. of Marine Biolo-

D. J. Slinn. Estuarine and Coastal Marine Science, Vol 2, No 1, p 1-25, January 1974. 12 fig, 40 ref.

Descriptors: *Ocean circulation, *Sea water, *Onsite investigations, 'Water quality, Water proper-ties, Thermal stratification, Turnovers, Oceans, Stratification, Thermocline, Salinity, Evaluation, Nutrients, Nitrates, Nitrites, Silicates, Phosphates, Dissolved oxygen, Distribution patterns, Profiles, Hydrologic data, Surveys, Bathythermographs, Chlorophyll.
Identifiers: *United Kingdom(Isle of Man), *Irish Sea, Hydrographic observations.

Results of hydrographic observations made in the Irish Sea to the west of the Isle of Man during 1954-1961 and 1965-1968 were presented and discussed. There was evidence that Atlantic water, although considerably diluted by fresh water run-off, penetrates southwards off the Irish coast. Winter hydrographic conditions tended to exhibit vertical uniformity, but bottom water of higher salinity which was also distinguishable by small temperature differences was sometimes present. During summer, surface warming brought about marked temperature layering which persisted and consolidated in the region characterized by weak

tidal currents. Associated with the temperature layering was a well defined pattern of nutrient, dissolved oxygen, and chlorophyll alp distribution. Nitrate virtually dissappeared during the summer and would thus seem to be the limiting nutrient. Coinciding with autumn was a rise in oxygen saturation in nutrients. The highest chlorophyll alpha concentrations, however, tended not to coincide with the highest oxygen saturations. In the deep with the highest oxygen saturations. In the dependent bottom water of the trough, nutrient concentra-tions remain high and oxygen saturations low, sug-gesting that this is due to regenerative processes. Following the breakdown of temperature layering, the autumnal overturn distributes nutrients evenly throughout the water column. Nitrite can be particularly high at this time but declined rapidly as nitrate and other nutrients increased. (Humphreys-W74-12322

A SUBSURFACE RIBBON OF COOL WATER OVER THE CONTINENTAL SHELF OFF OVER THE OREGON,

Oregon State Univ., Corvallis. School of Oceanog-

For primary bibliographic entry see Field 2E. W74-12324

LAGRANGIAN MEASUREMENTS IN A COASTAL UPWELLING ZONE OFF OREGON, Inter-American Tropical Tuna Commission, La Jolla, Calif.

For primary bibliographic entry see Field 2E. W74-12325

POTENTIAL OF GEOPHYSICAL METHODS FOR STUDYING FRESH-WATER DISCHARGES IN THE COASTAL ZONES OF SEAS.

V. A. Bogoslavskiy, and A. A. Ogil'vi. Soviet Hydrology: Selected Papers, No 1, p 51-57, 1973. 2 fig, 1 tab, 4 ref. Translated from Vodnyye Resursy, No 1, p 178-185, 1973.

Descriptors: *On-site data collections, *Coasts, Descriptors: "On-site data collections, "Coasts, "Subsurface mapping, "Instrumentation, Evalua-tion, Exploration, On-site investigations, Basic data collections, Electrical studies, Resistivity, Shores, Oceans, Geophysics, Hydrogeology, Sediment distribution, Discharge(Water), Electronic equipment, Profiles.

Identifiers: *USSR(Odessa region), *Abkhaz ASSR(Gantiadi), Geophysical methods, Black Sea, Caspian Sea.

Areal distribution of bottom sediments and mapping of submarine sources were determined by resistivity measurements and temperature profiling. Data compiled for the Black and Caspian Seas were tabulated for the resistivity of rocks on the sea floor as a function of their density and lithological composition. Electrical prospecting added to the information obtained by drilling on the geological section. Thermometric and electrometric measurements permitted fairly effective mapping of submarine sources and study of their discharge conditions. (Humphreys-ISWS) W74-12329

MEASUREMENTS OF SAND TRANSPORT BY WIND ON A NATURAL BEACH, J. N. Svasek, and J. H. J. Terwindt

Sedimentology, Vol 21, p 311-322, 1974. 8 fig, 10

Descriptors: *Beaches, *Velocity, *Saltation, *Sediment transport, *Shear stress, *Wind velocity, Sands, Tractive forces, Coastal engineering, Hydraulics, Sedimentology, Moisture con-

Identifiers: *Shear stress velocity, *Critical shear stress velocity, Velocity distribution.

Bagnold's and Kawamura's formula may be used for the calculation of the sand movement on a

natural beach provided the shear stress velocity is greater than 0.4 m/s. Great discrepancies were found between calculated and measured sand transport rates for sheer stress velocity less than 0.4 m/s mainly because of the capillary forces acting on a wet beach. The measured critical shear velocity at the beginning of sand movement on a clean dry beach agrees very well with that pre-dicted by Bagnold's formula. On a dry beach where the sand grains are stuck together, critical shear velocity was found to be about 10% higher. On a wet beach, initial sheer velocity appeared to depend on the moisture content of the surface layer. Grain size is a determining parameter in the critical sheer velocity moisture content relation. When the angle between the wind direction at sea and the dune face is between 15 degrees and 85 degrees the streamlines of the wind will bend in the vicinity of the dune face. In consequence this may influence the direction of sediment movement. (Yang-ISWS) W74-12334

CONTINENTAL SLOPE OF THE UNITED STATES-SEDIMENT TEXTURE OF THE NORTHEASTERN PART. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 2J.

THE POTENTIAL OF METEOROLOGICAL SATELLITE CLOUD OBSERVATIONS FOR DELINEATION OF SIGNIFICANT FEATURES OF COASTAL UPWELLING OFF OREGON, Earth Satellite Corp., Washington, D.C. For primary bibliographic entry see Field 7B. W74-12338

COASTAL - ESTUARINE AND NEARSHORE PROCESSES, AN ANNOTATED BIBLIOG-

Ocean Engineering Informaton Service, La Jolla,

E. Sinha, and B. McCosh. Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 006, \$6.00 in paper copy, \$2.25 in microfiche. Water Resources Scientific Information Center, Washington, D.C. Report WRSIC 74-207, June 1974, 230 p, 1009 ref. OWRT W-169(1). 14-31-0001-

Descriptors: *Bibliographies, *Estuaries, *Coasts, *Path of pollutants, Sedimentation, Sediment transport, Erosion, Beach erosion, Diffusion, Dispersion, Mixing, Salinity, Winds, Waves(Water), Tidal effects, Geomorphology, Geology, Meteorology, Oceanography.
Identifiers: *Nearshore, *Coastal waters, Flushing, Wave action, Wind effects.

A total 1009 annotated references to the literature on Coastal - Estuarine and Nearshore Processes is presented. The order of presentation is alphabetical by name of first author. A subject outline identifies the geologic, geomorphic, meteorologic and oceanographic references which deal with the highly variable interactions in the estuarine and in the nearshore zone. River discharge is an additional retrieval heading. Included in the subject outline is the identification of references on models, methods, and instruments used in the study of coastal processes. References to studies in various parts of the world are specified in the geographic outline. The list of bibliographies includes references to true bibliographies as well as to documents which contain 50 or more substantive references. An author index is included. The subject index, using descriptors and identifiers, provides rapid access to abstracts dealing with specific subject matter. Closing date for review of the literature for this bibliography was June 15, W74-12351

SOCIO-ECONOMIC IMPACT OF ESTUARINE

THERMAL POLLUTION,
MetroStudy Corp., Washington, D.C.
For primary bibliographic entry see Field 5C.

THE BOSPORUS, Stanford Research Inst., Irvine, Calif. C. G. Gunnerson, and E. Ozturgut.

In: The Black Sea-Geology, Chemistry, and Biology; Degens, E.T., and Ross, D.A., editors. American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 99-114, 1974. 14

Descriptors: *Straits, *Water circulation, *Sea water, Currents(Water), Channel morphology, Oceanography, Salinity, Density stratification. Identifiers: *Bosporus, *Black Sea.

The Bosporus is a strait 31 km long, whose bathymetry suggests the occurrence of past flood-flows. Small semidiurnal and fortnightly tides often are obsecured by wind effects which occassionally reverse the southerly surface flow from the Black Sea. At depth, northflowing Mediterranean water maintains the surface salinity of the Black Sea at about 1.75%. The location, thickness, and slope of the boundary layer vary according to tne bathymetry, season, and winds. (Knapp-USGS) W74-12372

ROLE OF THE BOSPORUS IN BLACK SEA CHEMISTRY AND SEDIMENTATION, ennsylvania State Univ., University Park. Dept.

of Geosciences. R. Scholten.

In: The Black-Sea--Geology, Chemistry, Biology; Degens, E.T., and Ross, D.A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 115-126, 1974. 7 fig. 29 ref.

Descriptors: *Water chemistry, *Sedimentation, *Straits, Estuaries, Water circulation, Salinity, Stratification, Stratified flow, Sea water, Density stratification. Identifiers: *Bosporus, *Black Sea

Because the Bosporus is the only connection between the fresh to brackish Black Sea and the saline Mediterranean Sea (via the Sea of Marmara and the Dardanelles), it has played a critical role in controlling fluctuations in salinity, oxygen con-tent, sedimentation, sea level, and life in the Black Sea. The original Bosporus valley apparently was cut by a south-flowing river which continued through the Dardanelles and was partly controlled by north-south faults. Upon drowning, the valley became a marine strait, although at times of glacial lowering of sea level it acted as a marine spillway or resumed its subaerial-valley condition with a central drainage divide. Its bedrock channel is at least 100 m below present sea level. The interface between the northward, saline bottom current and the southward, freshwater surface current slopes northward at an angle which is a function of the two densities and the hydraulic head. When sea level in only moderately high, the interface touches bottom south of the northern exist, and the saline bottom water is returned southward by the surface current. Only when sea level is higher than today can large quantities of Mediterranean water enter the Black Sea and bring salt and oxygen to the deep Black Sea bottom. (Knapp-USGS) W74-12373

EVOLUTION OF SOME MARSHES OF EAST-ERN PRISAYANYE, (IN RUSSIAN),

Irkutskii Gosudarstvennyi Universiteit (USSR). Dept. of Botany. I. G. Lyakhova. Biol Nauki. Vol 16, No 3, p 70-74. 1973.

Identifiers: *Marshes, Peat, *USSR(Eastern Prisavanve).

An analysis was made of contemporary plant life and stratification of peat deposits of marshes of the East Prisayanye (USSR). The considerable marsh character of the land is due to the low relief of the region, abundant flooding and the widely distributed neotectonic movements. The migration of river beds favors the predominant development of low marshes and retards their evolution to a lower level.—Copyright 1973, Biological Abstracts,

SEASONAL ASPECTS OF THE FIXATION OF BENTHIC EPIFAUNA OF THE INFRATIT-TORAL LEVEL IN THE ESTUARY OF THE SAINT LAWRENCE RIVER, University Coll. of North Wales, Bangor. Marine

Science Labs.

E. Bourget. J Fish Res Board Can. Vol 30, No 7, p 867-880,

1973. Illus. English summary. Identifiers: Abundance, Balanus sp., *Benthos, *Canada, Estuaries, Fauna, Polydora, *St-Lawrence River

For 2 seasons (May-Oct. 1969, 1970) the dynamic aspects of the settlement of benthic epifauna on ard substrata were studied. The stations were distributed on a 200-km distance, the salinity gradient ranging from 15-27%. Although over 60 spp. were identified on the plates, the analysis shows that only 3 of these are abundant: Polydora ciliata, Balanus balanoides, and B. crenatus. In general, batanus batanuses, and b. Crenatus. In general, the settlement period of the species is very short and most of the settling processes are concentrated in June, July, and Aug. The populations reached a peak of abundance during settlement and decreased regularly afterwards. This decrease is due mainly to intraspecific and interspecific competition for space, accumulation of sediment and hydrodynamic factors in autumn. The marked physical seasonality of this subarctic environment, more than true biotic succession, is reflected in the development of the community; during the summer, the community is biologically accom-modated whereas in autumn and winter it is physically controlled .-- Copyright 1973, Biological Abstracts. Inc. W74-12521

MARITIME SANDS.

B. Pettersson.

Acta Phytogeographica Suecica, Vol 50, p 105-110, 1965. 3 fig, 16 ref.

Descriptors: *Beaches, *Sands, *Vegetation, Shores, Lichens, Grasses, Pine trees, Fungi, Coasts, Dunes.

Identifiers: *Maritime sands, Sweden, Baltic Sea coasts, Bryophytes, Calciocolous therophytes.

Knowledge of the sand vegetation of Swedish shores is fragmentary. The part of the beach washed by waves is called foreshore and is rather flat or gently sloping. Next to the sea there is a desert-like belt of varying breadth with algal drift quite large stones are often floated onto the beach by means of Fucus vesiculosus attached to them. Above the foreshore a ridge of sand, the foredune, is often formed on exposed shores and built up by sand-collecting plants, above all Ammophila arenaria and Elymus arenarius. Mobile dunes (formed by wind) have often once been devoid of vegetation, but are colonized especially by Ammo phila in later stages when factors, responsible for sand mobility, have been eliminated. The earliest colonizers of the naked sand are crustaceous lichens, especially Lecidea uliginosa, L. granulosa, and Stereocaulon condensatum, accomlosa, and steteobation conditionally according panied by bryophytes, especially Ceratodon purpureus and Cephaloziella sp. In most districts, the foredune is succeeded inland by relatively smooth dry sandy fields, a type of heath inhabited by

Group 2L—Estuaries

several continental species and many southern calcicolous therophytes characteristic of 'alvar' vegetation on Gotland and Oland. The vegetation along the south and southeast coasts of the Baltic Sea is described. (Jones-Wisconsin)

REFECTS OF TOXAPHENE CONTAMINATION

ON ESTUARINE ECOLOGY, Georgia Univ., Sapelo Island. Marine Inst. For primary bibliographic entry see Field 5C. W74-12592

APPLICATION OF ERTS-1 DATA TO THE PROTECTION AND MANAGEMENT OF NEW

PROTECTION AND MANAGEMENT OF NEW JERSEY'S COASTAL ENVIRONMENT, Earth Satellite Corp., Washington, D.C. R. L. Mairs, R. T. Macomber, D. Stanczuk, F. J. Wobber, and R. S. Yunghans.
Available from NTIS, Springfield, Va 22161 as N74-16009, Price \$5.00 printed copy; \$2.25 microfiche. Progress Report No 304 to NASA Goddard Space Flight Center for the period July-December 1973. 47 p, 7 fig, 4 tab, append.

*Remote *Mapping, Satellites(Artificial), *Land use, Coasts, *New Jersey, Environment, Data collections, Monitoring, Flood plains, Waste disposal, Path of pollutants. Identifiers: ERTS.

Data from Earth Resources Technology Satellite (ERTS) has proven of value to New Jersey in monitoring dispersion and extent of offshore wastes disposal practices, detecting changes (primarily development) in the coastal zone, monitoring large scale circulation patterns in the nearshore zone, and in delineating coastal land resources and ecozones. ERTS is of greatest value to the State in terms of: land use change detection; waterfowl game management; offshore waste disposal; and floodplains mapping. (Knapp-USGS) W74-12639

QUANTIFICATION OF SHORELINE MEAN-

DERING, Virginia Univ., Charlottesville. Dept. of Environmental Sciences

For primary bibliographic entry see Field 2J. W74-12643

HYDRAULIC CONSTANTS OF TIDAL EN-TRANCES 1: DATA FROM NOS TIDE TABLES, CURRENT TABLES AND NAVIGATION

Florida Univ., Gainesville. Coll. of Engineering.

M. P. O'Brien, and R. R. Clark. Available from NTIS, Springfield, Va. 22161 as AD-773 627, Price \$3.75 printed copy, \$2.25 microfiche. Coastal and Engineering Laboratory, Technical Report No 21, November 1973. 47 p. 7 fig, 6 chart, 5 tab, 22 ref. ONR Contract N00014 68-A-0173-0020.

Descriptors: *Tidal waters, *Tidal effects, *Inlets(Waterways), *Discharge coefficient, Currents(Water), Roughness(F Discharge(Water), Tidal streams, Tides. Roughness(Hydraulic), Identifiers: Salinity gradient.

The flow in tidal inlets may be analyzed by means of empirical coefficients which are defined by a simple flow relationship. Methods commonly used in analyzing flow through tidal entrances on sandy coasts make assumptions regarding the geometry of the inlets and related flow regime which depart substantially from real flow conditions. Evaluation of the published data pertaining to the hydraulics of entrances indicates that the data are sufficiently accurate and representative to permit the determination of discharge coefficients and to identify categories of entrances with characteristic flow regimes. (Humphreys-ISWS) W74-12648

PARTICLE SIZE DISTRIBUTION AND SMALL-SCALE BED-FORMS ON SAND WAVES, CHES-APEAKE BAY ENTRANCE,

Old Dominion Univ., Norfolk, Va. Inst. of Oceanography.

J. C. Ludwick, and J. T. Wells. Available from NTIS, Springfield, Va. 22161 as AD-774 947, Price \$4.50 printed copy, \$2.25 microfiche. Technical Report No 12, January 15, 1974. 116 p, 24 fig, 14 tab, 66 ref. NR 388-098. ONR-GP Contract No N00014-70-C-0083.

Descriptors: *Sand waves, *Chesapeake Bay, *Sediment transport, Sedimentary structures, Sediment sorting, Statistical methods, Variability, Particle size, Provenance, *Virginia.

The relationship between sediment texture and topography was studied along five series of sand waves in Chesapeake Bay entrance, Virginia. Two types of sand waves are present: asymmetrical, migrating sand waves have coarse sediment on crests and fine in troughs, and near-symmetrical, stationary sand waves have fine sediment on crests and coarse in troughs. In general, bimodal sediment is present on crests of migrating sand waves and in troughs of stationary sand waves. is a progressive decrease in percentage of bimodal samples in the Bay entrance sand wave field with distance to the southeast, the direction of net sediment transport. Analysis of variance verifies textural trends. At times when currents are of sufficient strength to move all sediment sizes, brown coarse sand is carried from a source northwest of the sand wave field and mixed with the predominant gray fine sand. As velocities decrease, coarser sediment is deposited. A winnowing process continues to move finer sizes such that texturally distinct crests and troughs result. Observations by SCUBA divers reveal the widespread occurrence of small-scale bed-forms surmounting sand waves. Analysis of variance shows these trends insufficient to obscure observed sand wave textural trends. (Knapp-USGS) W74-12650

THE SALINITY GRADIENT AND VEGETA-TION IN THE SAUGATUCKET RIVER ESTUA-

Rhode Island Univ., Kingston. Coll. of Resource Development; Rhode Island Univ., Kingston. Dept. of Botany. E. M. Smith, and R. D. Wood.

Available from the National Technical Information Service, Springfield, Va 22161 as COM-74-10165, \$2.75 in paper copy, \$2.25 in microfiche. Rhode Island Univ. Marine Technical Report Series No 6.5 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Salinity, *Vegetation, *Estuaries, Saline water-freshwater interfaces.

Identifiers: *Saugatucket River(RI), South Kingstown(RI), Point Judith Pond(RI), Salinity dilu-

The Saugatucket River in South Kingstown Rhode Island, discharges into Point Judith (Salt) Pond, diluting the seawater along the estuary. To locate the region of greatest salinity change, 20 stations were established. On November 6, 1971, water samples were taken at low and high tide at the lower four stations. Samples were also taken at low water and four hours after low water at stations 8-16 on November 11 and at stations 1-7 on November 12. The delayed sampling was done to check the water at the period of maximum diu-tion. The plant life, growing and healthy at the sta-tions, was recorded. Water samples were titrated for salinity. The plant life provides a continuously operating salinity monitoring system. Results of the work in Point Judith Pond show that the greatest dilution (change in salinity) is in the mouth of the Saugatucket River from a point just above the Silver Lake Road bridge to the point where the river empties into Upper Pond and plant life occurs in predictable zones along this estuary, spe-cies being linked to the overall salinity range. (Jones-Wisconsin)

W74-12667

VEGETATIONAL ZONATION IN TWO SUC-CESSIONAL BRACKISH MARSHES OF THE CHESAPEAKE BAY, Duke Univ., Durham, N.C. Dept. of Botany.

For primary bibliographic entry see Field 5C. W74-12689

AUTOMATED GAS CHROMATOGRAPHIC ANALYSIS OF SULFUR POLLUTANTS, Varian Aerography, Walnut Creek, Calif.

For primary bibliographic entry see Field 5A. W74-12690

PRIMARY PHYTOPLANKTON PRODUCTIVI-TY IN THE EASTERN MURMAN BAYS, (IN RUSSIAN).

Murmanskii Morskoi Biologicheskii Institut (USSR).

For primary bibliographic entry see Field 5C. W74-12703

ECTOPARASITIC INFUSORIA OF STICKLEBACK FROM THE NEVA DELTA, USSR, (IN RUSSIAN), N. N. Banina.

Parazitologiya. Vol 7, No 3, p 220-226. 1973. Illus. Parazitoiogiy... English summary. *Infusoria,

*Stickleback. *USSR(Neva delta), *Ectoparasites.

Gasterosteus aculeatus and Pungitius pungitius are infected en masse with various ectoparasitic Infusoria. Complex relationships arising in this pecubiocoenosis between true parasites (Trichodina), Infusoria feeding on bacteria from water depths (Apiosoma, Epistylis) and predatory forms (Erastophrya) are considered .-- Copyright 1974, Biological Abstracts, Inc. W74-12706

A CONTRIBUTION TO THE ECOLOGICAL STUDY OF THE BOU REGREG ESTUARY: THE PROBLEM OF POLLUTION,

Institut Scientifique Cherifien, Rabat (Morocco). Lab. of Zoology. For primary bibliographic entry see Field 5C. W74-12712

HELMINTHS OF SOCKEYE

(ONCORHYNCHUS NERKA) FROM THE KVICHAK RIVER SYSTEM, BRISTOL BAY, ALASKA,
Battelle-Pacific Northwest Labs., Richland,

Wash. Ecosystems Dept. For primary bibliographic entry see Field 5C. W74-12719

THE LACK OF INORGANIC REMOVAL OF DISSOLVED SILICA DURING RIVER-OCEAN

University of South Florida, St. Petersburg. Marine Science Inst. For primary bibliographic entry see Field 5G. W74-12724

CLASSIFICATION AND COMMUNITY STRUC-TURE OF MACROBENTHOS IN THE HAMP-TON ROADS AREA, VIRGINIA, Virginia Inst. of Marine Science, Gloucester Point.

For primary bibliographic entry see Field 5A. W74-12727

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Water Yield Improvement—Group 3B

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

CONCEPTUAL DESIGN STUDY OF A 200 MIL-LION GALLON PER DAY VTE/MSF DESALINATION PLANT AND PROTOTYPE

MODULE,
Westinghouse Electric Corp., Lester, Pa.
D. Cane, D. M. Giorgione, J. W. Keen, D. L.
Moen, and R. L. Nalbone.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-233 229, \$15.00 in paper copy; \$2.25 in microfiche. Office of Saline Water, Report INT-OSW-RDPR-74-972, October 1970. 197 p, 16 ref. OSW Contract 14-30-

Descriptors: *Desalination plants, Nuclear energy, *Flash distillation, Nuclear powerplants, Elec-tric power production, *Operating costs, *Capital

Identifiers: Dual-purpose power water plant.

A multiple-effect distillation system which em-ploys an enhanced surface-vertical tube evaporator (VTE) as the basic element was selected as the primary object of this study. The VTE/MSF system was optimized to a system which would produce pure water from seawater at the minimum cost. A conceptual design of a prototype/module cost. A conceptual design of a prototype/module was developed which, when built, will demonstrate the feasibility of the 200 MGD plant. The minimum expected capacity of the prototype/module is 2.5 MGD. A conceptual design of a 200 MGD optimized conventional MSF distillation plant was also developed to determine the cost of water using this system. The total estimated capital cost of the MSF plant is \$143,601,000 and the water cost with public financing is 43.2 cents/1000 gal. The capital cost of the protytype/module, not including engineering and interest during construction, is estimated to be \$4,384,000. It appears that the VTE/MSF system offers a potential reduction of approximately 12% in water cost as compared to the conventional MSF system for large capacity plants (15 MGD and above). A comparison of the capital costs indicates a reduction of approximately 6% in favor of the VTE/MSF system. (OSW) W74-12207

PROCESS AND APPARATUS FOR MAKING HIGHLY PURE WATER,

HIGHLY PURE WATER, Hitachi Ltd., Tokyo (Japan). K. Izumi, and Z. Tamura. U.S. Patent No. 3,816,266, 4 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 923, No 2, p 672, June 11, 1974.

Descriptors: *Patents. *Evaporation, Condensation, *Desalination, *Power plants, Fresh water, Equipment.

Hot sea water emerging from an indirect con-denser is subjected to flash evaporation and the steam generated by the flash evaporation is condensed to obtain fresh water. The apparatus com-prises a plurality of vertical casing assemblies each consisting of a combination of a sea water flash chamber linked with an indirect condenser for receiving pre-heated sea water. The invention is applied to a 600 MW steam-power plant. The steam generated in a boiler is used for rotating a steam turbine and a dynamo to generate electricity. The major portion of the steam is condensed into water in a condenser. Water is obtained from the condenser at the rate of about 1,040 tons/h. Sea water is used as cooling water in the condenser, and at the power plant the sea water is sup-plied to the condenser at the rate of 69,700 tons/h. (Sinha-OEIS) W74-12450

METHOD AND APPARATUS FOR SALINE WATER CONVERSION, P S Roller

U.S. Patent No. 3,814,671, 5 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 923, No 1, p 261, June 4, 1974.

*Patents *Desalination Descriptors: *Vaporization, *Condensation, *Evaporation, Saline, Fresh water, Scaling.
Identifiers: Scale formation, Alkaline bicarbonate.

Saline water containing scale-forming alkaline bicarbonate is indirectly heated while avoiding al-kaline scale, due to the presence of recycled CO2. The heated saline water is flash vaporized and alkaline bicarbonate thermally decomposed, forming CO2, a precipitate of alkaline scale compound and flashed saline water. The flashed vapor with included CO2 is condensed and the CO2 released from hot condensate as evolved CO2; the latter is recycled to the saline water, while discharging excess evolved CO2. Precipitate of alkaline scale compound is separated from flashed saline water and employed as nucleant for precipitate formed in flash vaporization, whereby the thermal decomposition is accelerated. The flash vaporization may be conducted in stages, a slight residual of alkaline bicarbonate in the flashed saline water being thereby reduced to an indefinitely small value. The flashed saline water is evaporated in a multi-stage flash evaporator; or this combined with a surface heat evaporator forming concentrated brine and fresh water at high yield. (Sinha-OEIS) W74-12455

REVERSE OSMOSIS FOR MUNICIPAL WATER

Du Pont de Nemours (E.I.) and Co., Inc., Wilmington. Del. For primary bibliographic entry see Field 5D. W74-12513

3B. Water Yield Improvement

SURVEY OF WEATHER MODIFICATION IN THE SOVIET UNION: 1973, Arizona Univ., Tucson. Inst. of Atmospheric

Physics. L. J. Battan.

Available from NTIS, Springfield, Va 22161 as PB-222 822, Price \$4.75 printed copy; \$2.25 microfiche. Scientific Report No 27, May 1973. 51 p, 90 ref. NSF Grant GA-13949.

Descriptors: *Weather modification, *Reviews, *Research and development, Fog, Foreign research. Identifiers: *USSR.

Soviet research in weather modification is reviewed. Hail suppression and precipitation stimulation are major areas of activity in the USSR, and in recent years research on lightning suppression and the use of heat for the dissipation of warm fog in stratus has been studied. The articles surveyed show little evidence that Soviet scientists, unlike their American counterparts, are convinced of the value of randomized experiments in the evaluation of cloud seeding hypotheses and there is no evidence in this literature that Soviet scientists have been tackling the modification of scale weather phenomena. (Knapp-USGS)

PROJECT FOGGY CLOUD V, PANAMA CANAL WARM FOG DISPERSAL PROGRAM, Naval Weapons Center, China Lake, Calif. Navail Weapons Center, China Land Research Dept. R. S. Clark, T. L. Wright, R. W. Evert, R. B. Loveland, and R. E. Northup, Jr. Available from NTIS, Springfield, Va 22161 as AD-773 473, Price \$4.00 printed copy; \$2.25

microfiche. Technical Publication 5542, December 1973. 92 p, 51 fig, 17 tab, 19 ref, 2 append

Descriptors: *Weather modification, *Fog, *Canal zone, Cloud seeding, Monomolecular films, Air-craft, Clouds, Cloud physics, Meteorological data, Tropical regions. Identifiers: *Fog dispersal, Warm fogs.

Fogs that close the Panama Canal to navigation occur mainly in the Gaillard Cut section of the canal from August through November. In 1972 experiments were conducted along the Gaillard Cut to test a number of different means of dispersing and suppressing fog. Among the techniques tested were seeding by helicopter and fixed-wing aircraft with various fog-dispersal agents, ground-based seeding with various agents, and fog suppression by spreading monomolecular films on the canal surface. Also, tropical cumulus clouds were characterized. Several techniques proved promising enough to warrant further investigation and development. Most promising for the canal area was the suppression of fog by monomolecular films. Also promising were airborne seeding with glycerine and ground-based seeding with charged bubbles. (Knapp-USGS)

CLEARING USING HELICOPTER DOWNDRAFTS: A NUMERICAL MODEL, Atmospheric Sciences Lab., White Sands Missile

Range, N. Mex. W. S. Nordquist, Jr

W. S. Nordquist, Jr.

Available from NTIS, Springfield, Va 22161 as

AD-771 038 Price \$3.75 printed copy; \$2.25 microfiche. Research and Development Technical Report ECOM-5527, December 1973. 68 p, 5 fig, 8 tab. 34 ref, append.

Descriptors: *Fog, *Weather modification, *Aircraft, *Mathematical models, Numerical anal-ysis, Cloud physics, Ice fog, Particle size. Identifiers: *Helicopters, *Fog dispersal. *Fog,

Clearings can be made in fog when water drops are dispersed from a helicopter, but the downwash from the helicopter rather than the dispersed water might be the cause of the clearing. The feasibility of creating temporary clearings was demonstrated for shallow fogs at high, middle, and low latitudes, stratus cloud decks at low latitude, and ice fog at high latitude. The technique and its effects were simulated using a model which can be expressed mathematically and solved numerically. A onedimensional (vertical space dimension) parametric model combines the basic meteorological characteristics of a horizontally homogeneous fog existing in a laminar flow regime and the downward flow of air created by a hovering helicopter during the initial stages of downdraft formation. The fog is characterized by vertical profiles of tempera-ture, relative humidity, liquid water content, and horizontal wind speed and direction. The initial model formulation of the downdraft beneath the helicopter is characterized as air being drawn into the plane of the rotor blades horizontally from the environment and being forced downward after the combustion processes of the helicopter engines have increased the temperature and water vapor content. From the initial conditions at the helicopter hover level, the model provides estimates of the temperature, liquid and vapor water content, physical dimensions and speed of the downdraft during its descent. At the level where the downdraft speed becomes zero, the assumed level of maximum downdraft penetration, quantitative estimates are made of the dimensions of areal clearing, temperature, and relative humidity differences between the downdraft and the en-vironment, the horizontal displacement of the downdraft, and the liquid water content at the downdraft base. (Knapp-USGS)

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C-Use Of Water Of Impaired Quality

3C. Use Of Water Of Impaired Quality

STUDIES ON THE EFFECTS OF SEWAGE EF-FLUENT ON ARTHROPODS MATODES. SELECTED GROUPS AND PHYTOPATHIC

Michigan State Univ., East Lansing. Dept. of Entomology. or primary bibliographic entry see Field 5C.

W74-12202

3D. Conservation In Domestic and

W74-12354

Municipal Use

PLANNING AND HUMAN VALUES - AN INQUIRY INTO THE PHENOMENON OF URBAN GROWTH AND THE POSSIBILITY OF

ITS CONTROL THROUGH WATER AND LAND RELATED ACTIONS, Abt Associates, Inc., Cambridge, Mass For primary bibliographic entry see Field 6B.

THE CONCEPT OF CARRYING CAPACITY. Utah State Univ., Logan. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 6B. W74-12469

ENFORCING ENVIRONMENTAL LAW IN THE

CITY, New York City Corporation Counsel. For primary bibliographic entry see Field 6E. W74-12471

APPRAISAL OF OPERATING EFFICIENCY OF RECHARGE BASINS ON LONG ISLAND, NEW YORK, IN 1969.

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4B. W74-12655

3E. Conservation In Industry

RECOVERY OF TOXIC METALS FROM IN-DUSTRIAL EFFLUENT SOLUTIONS BY SOL-VENT EXTRACTION.

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5D. W74-12033

WATER QUALITY CONSIDERATION FOR THE METAL MINING INDUSTRY IN THE PACIFIC NORTHWEST.

Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 5G. W74-12085

MANAGEMENT INFORMATION IN THE WATER INDUSTRY, Sunderland and South Shields Water Co.

(Ontario). For primary bibliographic entry see Field 4A.

W74-12111

PRIMARY DATA ON ECONOMIC ACTIVITY AND WATER USE IN PROTOTYPE OIL SHALE DEVELOPMENT AREAS OF COLORADO: AN INITIAL INQUIRY,

Colorado State Univ., Fort Collins. Dept. of

For primary bibliographic entry see Field 6B.

PROCEEDINGS OF THE XV EUCEPA CON-FERENCE ON HARMONIZING PULP AND PAPER INDUSTRY WITH ENVIRONMENT, For primary bibliographic entry see Field 5G. W74-12400

PULP MILL WATER SYSTEM CLOSURE,

Products Research Lab., Stockholm For primary bibliographic entry see Field 5D. W74-12411

ESTABLISHMENT OF A CLOSED SYSTEM FOR THE PAPER MAKING PROCESS, For primary bibliographic entry see Field 5D. W74-12412

DESIGN PRINCIPLES OF WHITE WATER SYSTEMS WITH SPECIAL REFERENCE TO EFFLUENT CONTROL,
Jaakko Poyry and Co., Helsinki (Finland)

For primary bibliographic entry see Field 5D. W74-12413

FRACTIONAL INPLANT TREATMENT OF RECYCLE FLOWS BY ADVANCED TECHNIQUES,

Institute of Paper Chemistry, Appleton, Wis. For primary bibliographic entry see Field 5D.

CLARIFICATION OF WHITE WATER BY VACUUM FILTRATION (KLAERUNG VON WEISSWASSER DURCH VAKUUM-FILTRA-TION),

For primary bibliographic entry see Field 5D. W74-12415

EFFECTS OF RAW MATERIALS AND CHEMICAL ADDITIVES ON MILL EFFLUENT LOSSES,

Research Association for the Paper and Board, Printing and Packaging Industries, Leatherhead (England).

For primary bibliographic entry see Field 5D. W74-12416

THE TREATMENT AND REMOVAL OF WASTE WATER RESIDUAL SLUDGES IN THE THE TREATMENT PAPER INDUSTRY (DIE BEHANDLUNG UND BESEITIGUNG VON RESTABWAS SERSCHLAEMMEN DER PAPIERINDUSTRIE), RESTARWAS-Muenchen-Dachauer Papierfabriken Nicolaus G.m.b.H. (West Germany). For primary bibliographic entry see Field 5E. W74-12417

THE USE OF SILICATES AND POLYELEC-TROLYTES FOR FLOCCULATION,
Papiripari Vallalat Kutato- es Fejlesztointezete, Budapest (Hungary).

For primary bibliographic entry see Field 5D. W74-12420

THE BIOLOGICAL PURIFICATION OF PAPER INDUSTRY WASTE WATERS (DIE BIOLOGISCHE REINIGUNG VON RESTAB-WAESSERN DER PAPIERINDUSTRIE), INDUSTRY Attisholz Luterbach Cellulose A.G., (Switzerland). For primary bibliographic entry see Field 5D. W74-12421

TERTIARY METHODS OF WASTE TREAT-

Balfour-Italia, Rome (Italy). For primary bibliographic entry see Field 5D. W74-12422 ACTIVATED CARBON AND TECHNIQUES FOR COLOR REMOVAL FROM KRAFT MILL EFFLUENTS. Saint Regis Paper Co., Pensacola, Fla For primary bibliographic entry see Field 5D. W74-12423

NEW FINE PARTICLE TECHNOLOGIES AP-PLIED TO THE ENVIRONMENTAL PROBLEMS OF THE PAPER INDUSTRY, English China Clays Ltd., Saint Austell (England). For primary bibliographic entry see Field 5D. W74-12424

A STUDY OF THE EFFLUENT TREATMENT FROM AN ITALIAN PAPER MILL, Cartiera del Timavo, Trieste (Italy). For primary bibliographic entry see Field 5D. W74-12425

IMPACT OF POLLUTION ABATEMENT ON CAPITAL ALLOCATION AND PROFITABILI-

Canadian Pulp and Paper Association, Montreal (Ouebec). or primary bibliographic entry see Field 5G. W74-12426

AN INTERESTING METHOD OF ABATING POLLUTION IN THE PULP AND PAPER IN-

Ecolgenova, S.p.A., Genoa (Italy). For primary bibliographic entry see Field 5D. W74-12431

OIL AND GAS VERSUS WATER IN THE SOUTHWEST: CONFLICT OR COMPROMISE, Humble Oil and Refining Co., Corpus Christi, Tex. For primary bibliographic entry see Field 6E. W74-12549

3F. Conservation In Agriculture

INTERREGIONAL IMPACTS OF ALTERNA TIVE WATER POLICIES FOR IRRIGATION IN WESTERN UNITED STATES,

Wisconsin Univ., Madison. Dept. of Agricultural Economics., and Wisconsin Univ., Madison. Dept.

N. L. Meyer, and D. W. Bromley. Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 635, \$4.75 in paper copy, \$2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WRC-WIS74-03, June 1974. 133 p. 8 fig, 11 tab, 64 ref, 5 append. OWRT B-057-WIS(4).

Descriptors: *Water policy, *Water alloca-tion(Policy), *Alternative water use, *Regional economics, *Regional development, Water development, *Water distribution(Applied), *Farm management, Crop production, Sweet potatoes, Transportation, Idaho, Maine, *Irrigation water, *Cost analysis. Identifiers: Red River Valley.

An evaluation framework was developed which permits measuring the interregional effects that would result from water resource projects in the West. Further, the framework facilitates identifi-cation of intraregional shifts associated with project-induced interregional impacts. Impacts of four water policies were considered. Alternative water policies are: (a) continue present policy, (b) cease new construction and honor existing con-tracts on present projects, (c) build new water projects but increase water charges on new projects and (d) build new water projects only if they can repay the cost of delivering water for both new and existing projects. Each policy change was evaluated by region with respect to changes in

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

acreage, total revenue, farm revenue, processing revenue and transportation revenue. Aggregate changes in farm, processing and transportation revenues were also shown. Fall potatoes were used as a vehicle for the analysis. Continuing present water policy would encourage expansion of acreage in areas utilizing subsidized water. Production would remain constant or decline in higher cost production areas. Continuing present pricing policies on existing projects and ceasing construction of new projects implies expanded production would have to be through technical change in water use or through increased acreage in regions not dependent on publicly subsidized W74-12002

EFFECT OF ROW SPACING, SEED RATE, NUTRITION AND IRRIGATION ON ROOT GROWTH, NODULATION, QUALITY AND UPTAKE OF NUTRIENTS IN PEA (PISUM SATIVUM L. VAR. ARVENSE POIR.), Irrigation Research Centre, Sambalpur (India).

D. Lenka, and O. P. Gautam.

Indian J Agric Sci. Vol 42, No 8, p 676-680, 1972. Identifiers: *Fertilizers, *Growth rate, Irrigation, *Nitrogen, Nutrients, Nutrition, *Peas, Pisumsativum-var-arvense, Root zone, Seed, Absorp-

The length and weight of pea were not significantly influenced by the seed rate, row spacing and low dose of starter N. Application of starter N to the soils low in available N increased nodulation, but application to soils high in available N decreased it. Phosphate application and irrigation at both pre-flowering and flowering stages increased root growth and nodulation.--Copyright 1973, Biological Abstracts, Inc. W74-12156

THE ANSWER OF THE SOIL GENETIC CRITERIA TO THE OUESTION OF THE FUNC-TION AND DURABILITY OF AMELIORATING SUB-SOILING OF PSEUDOGLEY, Institut National de la Recherche Agronomique,

Tunis (Tunisia).

For primary bibliographic entry see Field 2G. W74-12157

PRIMARY CHECKING OF DATA MOISTURE RESERVES IN SOIL WITH ELECTRONIC COMPUTERS, (IN RUSSIAN), For primary bibliographic entry see Field 2G. W74-12159

SPRINKLER IRRIGATION AND ITS PROFITA-BILITY ON GRAIN GROWING FARMS IN SOUTHERN FINLAND, (IN FINNISH), Finnish Forest Research Inst., Helsinki

O. Kara.

Suom Maataloustiet Seuran Julk. 127. p 1-108,

1972. Illus. English summary.
Identifiers: *Barley, *Finland, Grain farms, Irrigation, Malting, Profits, Spring, *Sprinkler irrigation, *Wheat.

Irrigation often makes it possible to get malting rather than fodder barley and is recommended where feasible. Irrigation of spring wheat also often has good results.—Copyright 1974, Biological Abstracts, Inc. W74-12182

NITROGEN AND PHOSPHORUS FROM AGRONOMY PLOTS IN ALABAMA, LOSSES NORTH

Alabama A and M Univ., Normal. For primary bibliographic entry see Field 5B. W74-12221

CHARACTERISTICS OF WATER REGIME OF MALE AND FEMALE DIOECIOUS PLANTS AS A SIGN OF ADAPTATION TO A POOR WATER SUPPLY, (IN RUSSIAN), M. V. Sivtsey, and S. S. Sizov.

Biol Nauki 15(10): 78-82. Illus, 1972.

Identifiers: Adaptation, Asparagus, *Dioecious plants, Hemp, Lombardy poplar, Mulberry, Box elder, *Leaves.

The water regime of female leaves of diclinous plants (hemp.) spinach, sorrel, willow, asparagus, box elder, Lombardy poplar, mulberry) is more labile than male leaves. Female plants in comparison to male ones have a wider range of changeability which results in a higher degree of adjustment to the fluctuation of the water available to the plants. However, in an acute water shortage, the female plants exhibit less resistance than male leaves.-Copyright 1974, Biological Abstracts, Inc. W74-12237

CULTIVATION OF LAMINARIA IN JAPAN,

Hokkaido Regional Fisheries Research Lab., Yoichi (Japan). Y. Hasegawa.

Bull Hokkaido Reg Fish Res Lab. 37, p 46-48.

Identifiers: *Cultivation, *Japan, *Laminaria, *Reefs.

Cultivation of Laminaria involves mainly the use of stones or concrete blocks and blasting of reefs-preparing new surfaces on reefs by digging old ones which are exposed at low tide. Emphasis is on the cultivation of Laminaria on natural reefs. Cross-breeding a few species has been achieved.— Copyright 1974, Biological Abstracts, Inc. W74-12292

GHANATS OF IRAN: DRAINAGE OF SLOPING

Iranian Plan and Budget Organization, Tehran. Technical Bureau. For primary bibliographic entry see Field 4B. W74-12318

SOME EVIDENCE OF ECONOMICS OF SCALE IN HAWAIIAN SUGAR PLANTATION,
Hawaii Univ., Honolulu. Water Resources Hawaii Univ., Honolulu.

Research Center. J. E. T. Moncur.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 903, \$3.25 in paper copy, \$2.25 in microfiche. Technical Memorandum Report No 38, January 1974. 45 p, 17 fig. 3 tab, 18 ref. OWRT A-026-HI(1). 14-31-0001-3211.

Descriptors: *Sugar crops, Economics, *Hawaii, *Economies of scale, *Economic efficiency, *Economies of scale, Regression analysis. Withdrawal.

*Farrell's method, Unit isoquants, Identifiers:

Of the major sectors in Oahu's economy, sugar growing and milling together use by far the largest quantities of water. The three plantations still operating on Oahu in 1971 accounted for 57 percent of total withdrawals, even though this per-centage has steadily declined over the past decade or longer. A persistent trend among plantations, moreover, is for mergers to occur, presumably to take advantage of economics of scale. The effect of scale on sugar production was evaluated. Data for plantations on four of the Hawaiian Islands is applied in several procedures for estimating scale economics and economic efficiency. First, a 'survivorship' test is used. Then the efficiency measures developed by M. J. Farrell are calculated. Finally, some regression estimates are deter-W74-12344

SUBSURFACE IRRIGATION WITH HEATED WATER, ITS MANAGEMENT AND APPLICATION TOWARD REDUCTION OF THERMAL POLLUTION PROBLEMS, Minnesota Univ., Minneapolis. Dept. of Agricul-

tural Economics.

E. R. Allred.

E. R. Allred. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 036, \$300 in paper copy, \$2.25 in microfiche. Water Resources Research Center, Univ. of Minnesota, St. Paul, Mimeographed Report, June 1974. 20 p, 13 fig., 1 tab, 3 ref. OWRT B-057-Minn(1). 14-31-0001-3602.

Descriptors: Irrigation, Soils, Crops, *Minnesota, Thermal pollution, *Heated water, *Subsurface irrigation, Potatoes.
Identifiers: *Waste heat energy, *Soil-warming.

The purpose was to evaluate the use of waste heat energy for the growing of agricultural crops in northern climates, to determine the basic heat transmissibility characteristics of soil, and to evaluate crop frost protection benefits as the result of the soil warming process. The layout and the procedures described are based on field studies on a Hubbard loamy sand located at the Sand Plains Experimental Irrigation Field, near Elk River, Minnesota. The following conclusions can be made for the data obtained: Soil warming is necessary for extension of the growing season for field crops in Minnesota. Soil-warming cannot be done effectively by using an irrigation system alone. Artificial warming of a field soil by utilization of waste heat energy does not provide a significant protection for potatoes against frost at tempera-tures below 28 deg. F. Maturity date for early potato varieties grown in heated soil can be ad-vanced between two and three weeks, as compared to potatoes grown in unheated field soils. Only small quantities of waste heat energy can be utilized by a field soil in Minnesota during July and August. Moderate second crop yields are possible with heated soils in Minnesota, if replanting is done immediately following the first crop harvest. Because of unreasonably low air temperatures en-countered in 1974, the early potato harvest date was not advanced appreciably over 1973, even though frost protection measures were installed. (Walton-Minnesota) W74-12358

LARGE SPRINGS IN THE BLACK HILLS, SOUTH DAKOTA AND WYOMING, South Dakota School of Mines and Technology,

Rapid City. Dept. of Geological Engineering.
P. H. Rahn, and J. P. Gries.
Available from the National Technical Informa-

Avanable from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 066, \$3.25 paper copy, \$2.25 in microfiche. South Dakota Water Resources Institute, Brookings, Completion Report, February 1973, 24 p, 36 ref. OWRR A-021-SDAK(2).

Descriptors: *Groundwater movements, *Springs, Streamflow, *Recharge, *South Dakota, Streamflow, *Recharge, *South Dakot *Wyoming, Water loss, *Groundwater recharge. Identifiers: *Black Hills Area(So Dak).

Between 1966 and 1971, monthly stream gagings were conducted on most large streams and springs in the Black Hills of South Dakota and Wyoming. Streams draining the impermeable Precambrian core of the Hills lose an average of 40.5 cfs to sink-holes where streams cross the Paleozoic limestone belt flanking the Precambrian core. At the outer edge of the limestone large springs occur where the Triassic Spearfish acts as an impermeable dam to groundwater. The average of these springs is at least 189.4 cfs. The difference between the stream flow loss and the spring discharge is due to precipitation recharge falling directly on the limestone. Since there is probably little deep groundwater loss from this system, precipitation recharge and evapotranspiration rates on the limestone can be established. In general the

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

northern Hills has a precipitation recharge of at least 6.8 inches/year and the southern Hills at least 0.6 inches/year. Groundwater flow directions, based on dye tests, piezometric levels and discharge measurements show a generally southerly flow of ground water in the eastern flank of the limestone from the Rapid City area toward Hot Springs. (Wiersma-South Dakota) W74-12367

OPERATIONAL EVALUATION OF IRRIGA-TION SYSTEMS, South Dakota State Univ., Brookings, Water

Resources Inst.

D. D. Brosz.

Available from National Technical Information Service, Springfield, Va 22161 as PB-236 042, \$3.25 in paper copy, \$2.25 in microfiche. Comple-tion Report, June 1974. 22 p, 12 fig, 7 tab, 4 ref. OWRT A-030-SDAK(1).

Descriptors: Sprinkler irrigation, Subsurface irrigation, Trickle irrigation, Irrigation operation, Scheduling, Timing,
*Irrigation Water requirements, Scheduling, Timing,
*Irrigation design, Evaluation, *Irrigation systems, Corn(Field), Potatoes, *South Dakota,
*Crop response, *Crop production.

Three years' data were collected on yield responses of potato and corn crops irrigated by trickle. subsurface, and sprinkler irrigation systems. The field plots study included six irrigation system design treatments including every row and every other row trickle and subsurface irrigation; small frequent sprinkler application and larger in-frequent sprinkler application. Potato and corn production can be increased by 5 to 15 percent with 20 percent less water when it is applied through the use of trickle and subsurface irrigation rather than through sprinklers. A water savings of approximately 30 to 40 percent can be achieved with trickle and subsurface irrigation for yields that are comparable to those obtained with sprinklers. Tensiometers installed in the plots did show that the soil water tension was higher for the trickle and subsurface plots. The irrigation system design treatments had no effect on potato crop maturity or quality; however, the corn grain quali-ty for the sprinkler system applying small frequent irrigations was adversely affected because of black masses of spores (smut) appearing on the ears. (Wiersma-South Dakota State) W74-12368

MIGRATION OF INSECTS CAUSED BY ERECTION OF IRRIGATIONAL MAINS, (IN RUSSIAN).

For primary bibliographic entry see Field 2I. W74-12396

FORCED CULTIVATION OF LAMINARIA, Hokkaido Regional Fisheries Research Lab., Yoichi (Japan).

Y. Hasegawa. Bull Hokkaido Reg Fish Res Lab. 37 p 49-52, 1971. Identifiers: *Cultivation, *Japan, *Laminaria, Identifiers: *Cultivation, *Japan, *Laminari Temperature, *Plant growth, Plant reproduction.

Laminaria of good quality are usually 2-yr-old plants, those that go through 2 winters. A technique was developed for raising food quality plants in 1 yr. Good quality juvenile plants are produced 2-3 mo. ahead of natural germination produced 2-3 mo, anead of natural germinatour time, and cultivation starts when water tempera-ture is below 18C. Blades (10-15) of Laminaria are grown per meter of rope. The culture methods and the growth and reproduction of the plants are described.--Copyright 1974, Biological Abstracts, Inc. W74-12397

ANALYSIS OF PUMPING WELL NEAR A STREAM, Arizona Univ., Tucson.

For primary bibliographic entry see Field 4B.

W74-12531

December 13, 1972.

THE QUANTITY AND MOVEMENT OF NITRATES IN SOIL WATER IN TWO CONNECTICUT SOILS TREATED WITH HIGH AND LOW LEVELS OF INORGANIC NITROGEN

FERTILIZER,
Connecticut Univ., Storrs. Inst. of Water For primary bibliographic entry see Field 5B. W74-12595

YUMA IRRIGATION PROJECT-NOTICE OF OPERATION AND MAINTENANCE CHARGES. Federal Register, Vol 37, No 240, p 26536-26537.

*Regulation, *Irrigation, Operation and maintenance, *Maintenance costs, *Use rates, Water supply. users, Water supply, Irrigation efficiency, Land reclamation, Water allocation(Policy), reclamation, Water allocation(Policy), *California, *Arizona, Federal government, Water requirements, Water delivery, Agriculture, Irriga-tion water, Water management(Applied), Water contracts, Irrigation permits, Operating costs.

Identifiers: *Administrative regulations

Public notice is given of annual operation and maintenance charges and annual water rental charges, by the Department of the Interior, for the Yuma Irrigation Project in Arizona and California. The minimum operation and maintenance charge is \$15.75 per irrigable acre. The water user is entitled to eight acre-feet of water per acre and payment is made whether or not the water is used. Up to five acre-feet is available on non-sandy land. Additional water, if available, will be furnished at \$4.00 per acre-foot payable in advance. Credit for unused additional water will be given towards the succeeding years minimum charges. On written request and approval, water will be furnished to a water user free for reclaiming lands by the usual methods. Lands for which free water was served during the preceeding year will not get any more free water, unless in the opinion of the Project Manager, the results in the preceding year were unsatisfactory. All charges for water are payable in advance. If a water user fails to comply with any regulations, or if he does not pay bills or expenses of extra maintenance caused by faulty irrigation practices, the right to withhold delivery of maintenance caused by faulty irrigation practices, the right to withhold delivery of water is reserved. Late payments are penalized at .5% per month on the unpaid balance. (Sperling-Florida)

IRRIGATION AS A PRACTICAL MEANS TO CONTROL POTATO COMMON SCAB (STREPTOMYCES SCABIES): FINAL EXPERI-

MENT AND CONCLUSIONS,
Rothamsted Experimental Station, Harpended (England).

D. H. Lapwood, L. W. Wellings, and J. H.

Plant Pathol. Vol 22, No 1, p 35-41. 1973. Illus.

Descriptors: *Patotoes, Irrigation effects, Control. Infection, Diseases. Identifiers: Benomyl, Oxycarbon, Scab, Streptomyces-scabies

In 1971, irrigation had little no effect on yields but, when applied early in the season, greatly decreased common scab on the susceptible cultivars 'King Edward,' 'Majestic' and 'Desiree'. 'Record,' and especially 'Pentland Crown,' had little scab with or without irrigation. Most scab infection occurred during dry weather in late June and early July. Irrigation for 6 wk from 4 June, at 0.6 in. (15 mm) soil moisture deficit (SMD) controlled scab most effectively, but 6 wk was only marginally better than 4 wk. With other regimes, the severity of scab increased as the SMD allowed

irrigation was increased. 'King Edward' tubers irrigation was increased. King Edward tubers from unirrigated plots were blemished more in 1971 than in the 2 previous dry seasons, partly because rain caused tubers to swell more than previously and enlarged scab lesions to much that healthy tissue between scabs was ruptured. More tubers per plant were formed from 'King Edward when seed tubers were treated with benomyl and oxycarboxin before planting than when untreated, but irrigation even from 75% emergence had no ef-fect on tuber numbers, -- Copyright 1973, Biological Abstracts, Inc. W74-12694

RECENT DEVELOPMENTS IN PREPARING COLORED AGROCLIMATIC MAPS BY COM-

Department of Agriculture, Ottawa (Ontario). For primary bibliographic entry see Field 7C. W74-12695

EVALUATING CLIMATIC LIMITATIONS FOR

A SPECIFIC AGRICULTURAL ENTERPRISE, National Oceanic and Atmospheric Administra-tion, Washington, D.C. Environmental Data Ser-

Y. M. Yao.

1. M. 140. Agric Meteorol., Vol 12, No 1, p 65-73, 1973. Identifiers: Agricultural, *Climatic conditions, Dry, Enterprise, Evaluation, *Irrigation, Moisture, *Peanuts, Soils, *Tanzania, Africa.

The East Africa Goundnut (Peanut) Scheme of the late 1940's cited as an example of a costly miscal-culation of land use that might have been prevented by climatic assessment. At the site of this scheme, in what is now central Tanzania, water is the most restrictive factor determining natural environment. Adequate soil moisture, both near the surface and in the deeper root zone, is essential for groundnut production. Soil moisture data derived for Dodoma for 30 yr show that in the period mid-Jan.-mid-April the probability that the topsoil will remain dry for at least 16 consecutive days is 57%, and drops only to 37% for 21 or more consecutive days - even though this is the 'rainy season. The analysis further indicates that the elimination of the most serious periods of moisture shortage would require irrigation, at least once a year, in about 75% of the years. Moisture supplies are optimum for Dec.-April in only about 3% of the yr in both Dodoma and Kongwa. For comparison, the same type of climatological analysis for Tifton, Georgia and Norfolk, Virginia in the major peanut producing areas of the eastern coastal plains region of the USA, indicates that 30 yr produced no occurrences of dry topsoil for as ng as 16 consecutive days. Also, the climate there is so suitable for growing peanuts that irriga-tion in only 10% of the yr would practically eliminate all except the minor periods of water shortage hazard. The condition in Tifton is slightly less favorable than in Norfolk. However, even there, optimum moisture conditions were not high during the critical months .-- Copyright 1974, Biological Abstracts, Inc. W74-12699

ESTABLISHMENT OF GREEN PANIC AS IN-FLUENCED BY TYPE, AMOUNT AND PLACE-MENT OF VEGETATIVE MULCH,

Western Australia Univ., Nedlands. Dept. of Agronomy K. G. Rickert.

Aust J Exp Agric Anim Husb., Vol 13, No 62, p 268-274, 1973.

Identifiers: Density, Dolichos-lablab, Emergence, *Green panic, *Mulch, Panicum-maximum-var-trichoglume, Sawdust, Seedling, Sorghum, Stubble, Vegetative mulch.

Establishment of green panic (Panicum maximum var. trichoglume cv. 'Petrie'), was measured after sowing beneath mulches of sawdust, native pasture hay, barley straw, Dolichos lablab stubble

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

and sorghum stubble. Long, chaffed, or milled materials, all applied at 2500, 5000, or 10,000 kgh awere tested. Comparisons were made with a control (no mulch) in 2 experiments on a self-mulching clay at Gayndah, south-eastern Queensland (Australia). Seedling emergence with all surface mulches was superior to the control and to emergence from sowing into mulch incorporated in the surface soil. Optimum rates of mulch for emergence approached 5000 kg/ha but varied between experiments and with mulch types. Reducing mulch particle size did not consistently improve emergence relative to long straw. In a 3rd experiment, seedling emergence at 42 days after irrigation was directly related to the proportion of area covered by mulch irrespective of the arrangement of mulch bands. Seedling yield followed trends in plant density. Practical implications of the results are discussed.—Copyright 1974, Biological Abstracts, Inc

EFFECT OF SOIL WATER POTENTIAL ON GROWTH AND YIELD OF SUNFLOWER (HELIANTHUS ANNUUS),

Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation.
N. Sionit, S. R. Ghorashy, and M. Kheradnam.
J Agric Sci. Vol 81, No 1, p 113-116. 1973. Illus.
Identifiers: Growth rates, Helianthus annuus,
*Sunflower, *Soil water.

The effect of soil water potential of the root media on the vegetative growth, seed and oil yield of sunflower (cv. 'Record') grown in containers under field conditions was investigated. The weight of shoots and the total leaf area of plants before flowering significantly decreased with decrease in the water potential of the root media. There was a sharp reduction of shoot weight as the potential decreased from -0.32 to -1.25 bars and then a further slow decline as soil water potential dropped to -8.6 bars. There were no significant differences in the 100-seed weights and percentage of oil among the treatments, but the total number of seeds was significantly different. The data did not indicate the existence of a threshold water potential above which yield was independent of soil water potential, but rather that yield was a continuously decreasing function of soil water potential—Copyright 1974, Biological Abstracts, Inc. W74-12705

EFFECT OF DROUGHT ON CALLOSE DYNAMICS IN PLANT ANTHERS, (IN RUSSIAN),

Akademiya Nauk SSSR, Moscow. Inst. of Plant

Physiology. E. I. Barskaya, N. V. Balina, and E. V. Kanash.

Dokl Akad Nauk SSSR Ser Biol. Vol 208, No 2, p 476-478. 1973. Illus. Identifiers: Anthers, *Beans, *Callose, *Drought.

A comparative microscopic study of preparations of anther developmental phases of control and ex-

A comparative microscopic study of preparations of anther developmental phases of control and experimental bean plants established certain unique anomalies in the dynamics of callose in plants subjected to drought. If drought acted on the anther at the start of callose production, there was nonuniform deposition on the surface of the protoplast, along with thin layers of callose there were massive clusters stained bright red by Procion red. It is natural that irregularity in the deposition of callose should involve also a disturbance in its protective function against dehydration.—Copyright 1974, Biological Abstracts, Inc.

INFLUENCE OF THE RATIO BETWEEN MATRIC AND OSMOTIC SUCTIONS ON THE OAT AND FIRST-YEAR ALFALFA YIELDS, (IN RUMANIAN).

RUMANIAN), Institutul de Studii si Cercetari Pedolosie, Bucharest (Rumania).

A. Maianu, I. Axenova, I. Albescu, and A. Maniu. An Inst Stud Cercet Pedol. 39, p 39-48, 1971. English summary. Identifiers: *Alfalfa, *Soil moisture, *Oats, *Osmotic pressure.

The influence of soil total suction, resulting from matric and osmotic suction, on growth and yields of alfalfa and oats was studied. Plants were cropped on 3 soils of different texture types: coarse, medium and fine. Good oat and alfalfa yields can be obtained on non-saline soils if soil moisture does not decrease under 50% of soil available water and under soil equivalent moisture, respectively. The increase of somotic solution suction at these soil moisture levels greatly decreases the yields. Increase of som moisture up to the value of field water capacity decreases the negative effect of salts. Minimum oat and alfalfa yields were obtained on sandy soils at all values of total suction, independently of the ratio between matric and osmotic suction.—Copyright 1974, Biological Abstracts, Inc. W74-12715

EFFECT OF CORN STOVER ON PHOSPHORUS IN RUN-OFF FROM NONTILLED SOIL,

Guelph Univ. (Ontario). Dept. of Land Resource Science.

J. W. Ketcheson, and J. J. Onderdonk. Agron J. Vol 65, No 1, p 69-71, 1973.

Descriptors: *Corn(Field), *Runoff, *Mulching, Fe.tilizers, Phosphates, Erosion control, Soil stabilization, Cultivation, Soil management, Phosphorus. Identifiers: *Stover.

The effect of stover on soil and P removal was determined for a well-drained till soil (Guelph loam) with 7% slope. Corn (Zea mays L.) was planted without tillage after 32P-tagged P fertilizer was applied broadcast and covered with a corn stover mulch in 1 treatment or left bare in a 2nd treatment. Run-off was collected and analyzed from 1 simulated and from 2 natural rainfall events. Stover reduced soil P in run-off by 65% and fertilizer P by 97%. These reductions were achieved by a decrease in total run-off and by a decrease in the concentration of suspended soil in decrease in the cohecutration of suspended soin it. Of the 29 kg of fertilizer P applied per ha, 3.85 kg (13%) and 0.13 kg (less than 1%) were removed over all run-off events from the no stover and stover treatments, respectively. This corstover treatments, respectively. This cor-responded to 8.5 and 1.3%, respectively, of the total P removal, which varied from 45 kg/ha without stover to 10 kg/ha with stover. The liquid fraction of the run-off carried the least amounts of either soil or fertilizer P. Proportionately more fertilizer P was found in the coarse (greater than 50 micro) soil than in the fine fraction (less than 50 micro), whereas proportionately more soil P was found in the latter than in the former, suggesting that fertilizer P is preferentially associated with the coarse fraction.--Copyright 1973, Biological Abstracts, Inc. W74-12722

INVESTIGATIONS OF THE METEOROLOGICAL INFLUENCES ON THE INCREASE OF DRY MATTER AND STALK LENGTH FOR SPRING BARLEY AND WINTER WHEAT IN THE PANNONIAN CLIMATE AREA: I. METHOD SYNOPSIS AND RESULTS OF THE PRELIMINARY EXPERIMENTS OF 1970, (IN GERMAN)

Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).

W. Mueller, and P. Ruckenbauer.
Arch Meteorol Geophys Bioklimatol Ser B Klimatol Umweltmeteorol Strahlungs Forsch. Vol 21, No 1, p 77-98, 1973. Illus. (English summary). Identifiers: *Barley, Temperature, *Solar radia-

tion, *Soil moisture.

Correlations were analyzed between biometeorological parameters and dry matter increase of spring barley (Hordeum vulgare) and winter wheat (Triticum aestivum) during approximately 5-day intervals. Some significant statistical correlations between total solar radiation, soil temperature in the root zone, soil water balance and the dry matter increase of cereal plants were observed.—Copyright 1974, Biological Abstracts, Inc.

NITRATES, NITRITES; THEIR RELATIONSHIP TO ANIMALS, MAN: IV. FACTORS CAUSING A CONCENTRATION IN FOODER CROPS OF NITRATES, NITRITES: THEIR DEPENDENCE UPON ECOLOGICAL FACTORS; TIME OF STORAGE, (IN GERMAN),

Institut fuer Immunobiologie, Berlin (East Germany)

For primary bibliographic entry see Field 5B. W74-12741

CHARACTERISTICS OF THE WATER REGIME OF PEAS AT DIFFERENT SOIL MOISTURE LEVELS AND WITH THE USE OF MOLYB-DENUM, (IN RUSSIAN). For primary bibliographic entry see Field 21.

For primary bibliographic entry see Field 21. W74-12749

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SURFACE-WATER INVESTIGATIONS ON THE LUMMI INDIAN RESERVATION, WASHINGTON

Geological Survey, Tacoma, Wash. G. G. Parker, Jr.

G. G. Parker, Jr. Open-file report, 1974. 69 p, 21 fig, 7 tab, 14 ref, append.

Descriptors: *Surface waters, *Aquiculture, *Estuaries, *Indian reservations, *Washington, Sea water, Water quality, Water circulation, Rivers, Dye releases, Dispersion, Path of pollutants, Fish hatcheries, Water pollution effects. Identifiers: *Lummi Indian Reservation(Wash).

Surface waters were investigated on the Lummi Indian Reservation, Washington. The investigation was oriented to potential water-related problems which could affect the success of the Lummi Indians' aquaculture program. Included were studies of (1) the Skookum Creek hatchery, which hatches and raises fish for the Indians, (2) the Kwina Slough fish pens, which use water from the slough and Nooksack River, (3) traveltimes and rates of dispersion of water in the Nooksack River and the slough relative to possible effects of pollutants from upstream areas, and (4) the aquaculture pond and adjacent marine waters, to determine volume of the pond and the patterns of water movement within, and to and from, the pond. Water discharge in Kwina Slough ranged from zero to more than 1,300 cubic feet per second, and, between high tides during low-flow periods, there is not sufficient channel storage to provide continuously flowing water through the fish pens. Thus, year-round operation of the fish pens in Kwina Slough is not feasible and the fish must be removed prior to the low-flow period. The aquaculture pond on Lummi Bay has a maximum volume of over 80 million cubic feet of sea water. Dye studies in the pond indicate that the primary control of the movement of water entering the pond is the volume of the inflowing water, which is controlled by the tide height and condition of tide gates. Most of the water that enters the pond inlet gates originates in Hale Passage. Samples of the inflowing water contained very little sediment, and deposition is negligible. The sanitary quality of the marine waters is good. (Knapp-USGS)

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

UNITED STATES GEOLOGICAL SURVEY

ALASKA PROGRAM, 1974. Geological Survey, Washington, D.C. Circular 700, 1974. 63 p, 15 fig, 51 ref.

Descriptors: *Alaska, *Geology, *Water resources, *Research facilities, *Projects, In-*Water vestigations, Geologic investigations, Data collections, Surveys

This report on the Alaskan activities of the U.S. Geological Survey contains up-to-date accounts of recent results and summaries of plans for the summer of 1974. It is organized in six parts: (1) responsibilities and services of the Geological Survey; (2) organization of the U.S. Geological Survey; (3) Alaskan field activities for 1974; (4) cooperative programs with state and federal agencies; (5) summary of important results of geological and geophysical research in 1973, and (6) reports published by Survey authors in 1973. (Knapp-USGS) W74-12012

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO USING ERTS-1 DATA: PROGRESS REPORT II.

Colorado School of Mines, Golden. Dept. of Geology.

For primary bibliographic entry see Field 7B. W74-12016

WATER RESOURCES OF THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 7C. W74-12056

ERTS-1 APPLICATIONS IN HYDROLOGY AND WATER RESOURCES,

National Aeronautics and Space Administration. Greenbelt, Md. Goddard Space Flight Center For primary bibliographic entry see Field 7B. W74-12062

PREDICTING DEPTH-DISCHARGE RELA-TIONSHIPS FOR SAND-BED RIVERS, Manitoba Univ., Winnipeg. Dept. of Civil En-

Manitoba Univ., Wilmipeg. Dept. of Civil Engineering.
V. J. Galay, and J. M. Cheung.
In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 129-143. 6 fig, 2 tab, 25 ref.

Descriptors: *Stage-discharge relations, *Alluvial channels, Sands, Regime, Dunes, Discharge(Water), Hydraulics, Flow measurement, *Discharge measurement, Stream gages, Water measurement. Identifiers: *Sand-bed rivers.

The many methods available for the prediction of depth-discharge relationships for natural sand-bed rivers are reviewed. These methods are based on a variety of basic assumptions as well as a wide range of data. Application of these methods to several types of rivers indicates that some of them are unreliable. Data from several sand-bed rivers was re-analyzed and a method based on adjust-ment of the flow depth was developed. This method yields reliable depth-discharge relation-ships for sand-bed rivers in the low flow regime (dunes). (See also W74-12087) (Knapp-USGS) W74-12093

WATERSHED MODELLING USING A SQUARE GRID TECHNIQUE, Waterloo Univ. (Ontario). Dept. of Civil Engineer-

ing. For primary bibliographic entry see Field 2A.

W74-12105

COMPUTER USES IN WATER SYSTEMS: CON-FERENCE PAPERS.

Water Research Association, Marlow, (England). For primary bibliographic entry see Field 6A.

MANAGEMENT INFORMATION IN THE WATER INDUSTRY.

Sunderland and South Shields Water Co. (Ontario) R. R. W. E. White, and S. Shail.

In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 11-27, September 1973.

Descriptors: *Management, *Reviews, Computers, *Water supply development, *Industries, Computer programs, Economics.
Identifiers: Regional Water Authorities(Eng),

Costing, Statistical reports, Information.

Presented is a review of the current use of computers in providing management information in the water supply industry. First, the present situation in the industry as a whole is considered. Reported are the findings of a Sub-Committee on the use of computers in the Water Industry, set up in July of 1966. Second, some practical problems encountered in the provision of management information in the medium-sized Sunderland and South Shields Water Company (England) are examined. Until fairly recently, the quantity of information such as costing and statistical reports has been too little and its availability has been too late. Work done by the 360/25 computer is discussed; considered are the machine's six suites of programs: (1) water rate accounting; (2) accountancy and costing; (3) payroll; (4) metered supply accounting; (5) stocks and dividends; and (6) engineering and operational. Finally, future prospects for management in the water supply industry are discussed. The industry is being absorbed into a more complex organization, with objectives changing due to a scarcity of national resources. Future demands must be estimated. The new Regional Water Authorities, set up in April 1964, hold responsibility for all the services forming the various parts of the hydrological cycle; the objectives of all these authorities will presumably be the same. This presents a perfect opportunity to install computing facilities on an industry-wide basis. (See also W74-12107) (Bell-Cornell) rate accounting; (2) accountancy and costing; (3) 12107) (Bell-Cornell) W74-12111

AN INTEGRATED MODEL FOR THE PLANNING AND OPERATION OF WATER SYSTEMS, Water Research Association, Marlow, (England).

Economics Group.
For primary bibliographic entry see Field 6A.
W74-12113

SYSTEMS AND TECHNIQUES FOR RESOURCE PLANNING, Water Resources Board, Reading (England).

For primary bibliographic entry see Field 6A. W74-12114

FORECASTING POLLUTION IN RIVERS, ESTUARIES AND THE SEA, Water Pollution Research Lab., Stevenage

(England).

For primary bibliographic entry see Field 5B. W74-12116

REMOTE CONTROL OF A WATER SYSTEM USING AN ON-LINE MINI COMPUTER, East Worcestershire Waterworks Co. (England).

For primary bibliographic entry see Field 7C.

AN INTRODUCTION TO COMPUTER INFOR-MATION SYSTEMS IN DISTRIBUTION

R. R. Miller.

In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 265-274, 25-27 September 1973. 3 fig, 9 ref.

Descriptors: Computers, *Water supply, *Networks, *Data collections. Water distribution(Applied), Communication, Management, Planning, Graphical methods, Maps.

Identifiers: *Information collection, Regional

Water Authorities(England), Tabular techniques, Cartographic techniques.

Various computer techniques for recording, retrieving and presenting information concerning water supply systems and networks, in both the specific and the broadest sense, are introduced. Tabular and cartographic techniques are dealt with, including the digitization of Ordnance Surwith, including the digitization of Ordnance Survey maps. Examples of particular applications already used in urban planning systems, including line printer maps using letter intensity and overprinting, are considered. The paper concludes with a look at other more advanced graphical techniques. Information regarding a distribution system and the other parameters affecting water supply must be easily summarized, digested and up-dated; the first and largest phase of these ventures is information collecting. As this information becomes more generally available, the techniques described and form a basis of systems for its presentation to all interested parties. (See also presentation to all interested parties. (See also W74-12107) (Bell-Cornell) W74-12122

COMPUTER USES IN WATER SYSTEMS: CON-

TRIBUTED PAPERS.
Water Research Association, Marlow (England). For primary bibliographic entry see Field 6A. W74-12126

PROPOSED KIELDER WATER RESERVOIR SCHEME COMPUTER APPLICATION IN YIELD ASSESSMENT,

Northumbrian River Authority (England). II V Burston

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 20-25, 25-27 September 1973. 3 fig.

Descriptors: *Computer programs, *Simulation Descriptors: "Computer programs, "Simulation analysis, "Water supply development, "Water demand, "Withdrawal, Water transfer, Reservoirs, Rivers, Design, Operations, Flow, Data collections, Catchments, Systems analysis, Estimating, Identifiers: "River authorities."

Described is the proposed Kielder Water Scheme designed to meet future major industrial and domestic demands within the three-river Northumbrian River Authority area. The scheme consists of a 44,000 m.g. capacity regulating reservoir, a major river intake and pumping station, and a 25-mile-long aqueduct. The proposed water release and transfer strategy is described briefly. On the basis of a three-year design period and assumed abstraction, (withdrawal), conditions. sumed abstraction (withdrawal) conditions, the yield of the scheme was assessed by hand calculating the maximum demands which could be met by the system, including the presently existing reservoir and river abstraction operations. Discussed is a computer program for simulation of the daily operation of the proposed system. In this program, the computer daily examines the natural flow at the abstraction point on the three rivers, based on gaging station records, adjusts this flow for the ef-fect of any reservoirs in the catchment and calcu-lates the gross make-up required (if any) at each abstraction point, using an assumed figure of 15% for operating losses. The study has indicated that the basic Kielder Water Scheme would, on present demand estimates, meet additional demands

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

within the River Authority's area until the years 2005 and 2003 respectively. (See also W74-12107) (Rell-Cornell) W74-12130

GENERAL ENGINEERING COMPUTER USE AT THE WELLAND AND NENE RIVER AT THE WELLAND AND NENE RI AUTHORITY, Welland and Nene River Authority (England).

M. V. Gibbons.

In: Computer Uses in Water Systems: Contributed nn. Computer Uses in Water Systems: Contributed Papers. A Water Research Association Con-ference, University of Reading, England, p 26-29, 25-27 September 1973.

Descriptors: Computers, *River basin commissions, *Water resources, *Design, *Land use, *Drainage, *Computer programs, Hydrometry, Data processing, Environmental engineering, Hydrology, Simulation analysis, Dynamic programming, Reservoirs, Mathematical models, Systems analysis.

In 1969, a computer aided design center was made available to the Authority as a result of work relating to hydrological design of a reservoir.

Described briefly is the center's multiple access system and ainteractive computing facilities. Computer work presently being carried out by the Authority is divided into three groups: (1) water resources design; (2) land drainage design; and (3) hydrometric data processing. A brief description is given of some of the main programs under each of the three groupings. Considered in group 1 are the production of synthetic data from short records, the use of digital simulation models, and dynamic programming for producing detailed optimal reservoir control rules. From group 2, the author considers two backwater curve programs based on the standard step method, the plotting of river cross sections, and determination of the capacities of flood storage reservoirs. Mentioned briefly from group 3 are a program developed for use with license classification and analysis, and the design of flat-vee weirs. These descriptions indicate the general use to which the computer is being put in the Engineer's department of a medium sized River Authority. (See also W74-12107) (Bell-Cornell) W74-12131

THE DESIGN OF A TWO-RESERVOIR RIVER REGULATING SCHEME,

South Staffordshire Waterworks Co. (England). M. H. Harley, and T. R. E. Chidley. In: Computer Uses in Water Systems: Contributed

Papers. A Water Research Association Conference, University of Reading, England, p 30-34, 25-27 Septem 1973. 2 fig, 3 ref.

Descriptors: *Design, *River regulation, *Reservoirs, *Dynamic programming, Stochastic processes, Decision making, Reservoir releases, Flow, Alternative planning, Probability, Compu-ters, Systems analysis, Water demand, Simulation

Identifiers: *River Dee(North Wales).

Described are the principal findings of a study in which the Dynamic Programming Principle was applied to the design of a river regulation scheme. The problem was to find how much water to release each month from each reservoir to meet the demand for regulation and compensation water. Effectiveness was measured by the sum of water. Effectiveness was measured by the sum of the deficits incurred over a long period of time. Different methods of applying the technique of dynamic programming were explored. It was found that stochastic dynamic programming introduced problems of state space; policy iteration and value iteration were considered in terms of efficiency and acquirects to the alphal entirement. ficiency and convergence to the global optimum. For stochastic dynamic programs the policy itera-tion technique was found to be unsuitable in practice. Deterministic dynamic programming was found to yield near optimal policies for even short flow sequences of 25-50 years. In each case, the policy determined by the dynamic program was simulated on historic and synthetic flow data. This whole process was embedded into a version of the Problem Oriented Language HYDRO developed by the authors. Deterministic dynamic programming was found to be an easy, efficient, and flexible technique for reservoir operations design. Its yielded policies were as good as those developed by weeks of simulation. (See also W74-12107) (Bell-Cornell) W74-12132

THE USE OF A COMMERCIAL TIME-SHAR-ING COMPUTER FOR WATER RESOURCE

Severn River Authority (England). For primary bibliographic entry see Field 6A. W74-12133

WATER RESOURCE DEVELOPMENT

Cornwall River Authority, Launcestor (England). F. L. Oates.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 39-51, 25-27 September 1974. 9 fig.

Descriptors: *Water resources development, *Computer programs, *Water supply, *Regional development, Design, Operations, Management, Reservoirs, Hydrology, Costs, Economics, Decision making, Mathematical models, Systems analysis, Simulation analysis.

Identifiers: Alternative schemes, Comparison, River authorities.

In order to deal with the multiplicity of sources and reservoir sites possible for development, the Cornwall River Authority evolved a computerbased system for the comparison of schemes on a common basis and for the design and operation of integrated regional water supplies. A costing manual was prepared providing unit costs and curves for all elements of water resources development schemes. Standard programs for costing assessment of yield of reservoir schemes were developed. The economics of various patterns of development to meet present and future demands were then compared on a regional basis. From over 70 alternative future reservoir sites, 3 were selected to serve the Authority's area. It was found that considerable savings could be achieved by the complete integration and linking of existing and proposed future water supply systems. Computer programs, simulating the systems through a synthetic drought flow pattern, were used for design purposes. To make accurate evaluation of operating costs and drawdown, the systems had to be simulated through long term flow sequences. This work was found to have obvious applications in the field of operational management. Programs are being developed to devise operating rules and management instructions to minimize operating costs and reservoir drawdowns. (See also W74-12107) (Bell-Cornell) W74-12134

COMPUTER AIDED ECONOMIC DESIGN OF WATER DISTRIBUTION SYSTEM, University Coll., London (England). Dept. of Civil

Engineering.
For primary bibliographic entry see Field 8B.

COMPUTER ORIENTED APPROACH OF A WATER DISTRIBUTION SYSTEM,

National Inst. of Scientific Research, Quebec. H. Demard, B. Bobee, and J. P. Villeneuve. n. Demaru, B. Booce, and J. P. Villeneuve.
In: Computer Uses in Water Systems: Contributed
Papers. A Water Research Association Conference, University of Reading, England, p 85-88,
25-27 September 1973. 5 ref. Descriptors: *Water distribution(Applied), *Networks, Computers, *Water demand, *Data processing, Pricing, Water resources, Research, Analysis. Identifiers: Real-time control.

A prevailing approach to water distribution is one which considers water as a limited resource and aims at influencing the demand, by using such means as pressure variation, drawing up a water rate structure, etc. At INRS-Eau, a research group is studying and achieving the measures which may be used in this approach. Their program consists of comprehensive analysis of the different com-ponents of a water distribution network: (1) the demand structure (space-time variations); (2) the net-work's behavior; (3) the real time control as a result of the two previous steps; and (4) a pricing policy. Achievement of these steps involves data acquisition, processing and analysis, as well as process control and therefore necessitates computer aid. These steps are discussed together with the role played by the computer in accomplishing them. Computers are the major tools for: acquisi-tion of demand data; building up a forecasting model; knowledge of system behavior; and real-time control of the system. (See also W74-12107) (Bell-Cornell) W74-12142

AN INVESTIGATION OF THE OPTIONAL ON-LINE CONTROL OF A WATER SUPPLY NET-WORK.

Cambridge Univ. (England). Engineering Lab. F. Fallside, and P. F. Perry. In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 89-93, 25-27 September 1973. 3 fig, 4 ref.

Descriptors: "Water supply, "Networks, "Operations research, "Simulation analysis, Computers, Operating costs, Reservoirs, Pipes, Optimization, Flow, Mathematical models, Equations, Systems analysis, Linear programming, Identifiers: "On-line control, "Cost minimization, plants, plants, Deally, Nos linear, pro-Production plants, Daily, Non-linear programming.

For distribution systems it is often appropriate to or distribution systems it is often appropriate to use an optimal control in which control inputs are calculated to minimize a performance index subject to certain constraints imposed by the plant; operating cost is well-defined and can be included in the performance index, leading to least cost operation of the network. The technical problems in implementing such a control are discussed. A collaborative project for introducing an optimal on-line control for a specific water supply network is described. System modeling and formulation of is described, system indeeding and of infinitiation the optimal control problem are discussed. The model chosen for the water system simulates the plant by a series of nodes, each of which has associated with it some or all of the following elesociated with it some or all of the tolowing eiements: (1) production plant; (2) reservoirs; (3) pipelines; and (4) boosters. The optimization program finds the optimal flows every 2 hours for meeting the typical daily consumption pattern. It also calculates best flow distribution between asso cacculates best flow distribution between source stations for meeting the base of the con-sumer load and the optimum reservoir levels for meeting the diurnal fluctuation in demand. Calcu-lations were done on an IBM 370/165 computer with relatively little computer time. The ultimate aim for the on-line optimal control of the network is to produce an integrated set of programs covering prediction, analysis and optimization which will operate satisfactorily in an on-line environ-ment. (See also W74-12107) (Bell-Cornell) W74-12143

LAY-OUT AND DIAMETER OPTIMIZATION FOR A LOOPED WATER TRANSPORTATION

FOR A LOCAL NETWORK, Municipal Water Works of Rotterdam

J. Haijkens, and A. Wedemeier.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

In: Computer Uses in Water Systems: Contributed In: Computer Oses in Water Systems, Controlled Papers. A Water Research Association Conference, University of Reading, England, p 94-97, 25-27 September 1973. 1 fig, 3 equ.

Descriptors: *Water distribution(Applied), *Networks, *Design, Constraints, *Water supply development, Water demand, Pipe flow, Pressure Water works, *Optimization, Investment, Costs, Equations, Mathematical models, Systems analy-

Identifiers: *Pipe diameter, Looped networks, Pipe bursts, Algebraic symbols, Surplus capacity.

Considered is the optimization of water distribution systems. In the case of a looped network, an approximation of an optimum is a difficult iterative procedure, which does not always yield the tive procedure, which does not always yield the desired solution. To deal with this problem, the Rotterdam Waterworks is considering the importance of building the requirements for a continuous water supply to customers into a programming model. An objective is to insure that even during pipe burst, sufficient water can be supplied under reasonable pressure to each user. Discussed are the constraints which must be set in Discussed are the constraints which must be set in designing such a looped network. Demands must be made to the mutual ratio of the diameters of the incoming or outgoing pipes of a junction, and a certain surplus capacity must be introduced into the network. The outgoing pipes—in case of a burst in an incoming pipe—should be considered as potential incoming pipes. Formation of the objective function requires judgement about the pressure drop per unit of pipe length. A simple examsure drop per unit of pipe length. A simple example illustrates how a relationship can be found between the flow capacity and the investment costs for the laying on of a pipe with a certain diameter. (See also W74-12107) (Bell-Cornell) W74-12144

ANALOGUE AND HYBRID METHODS FOR THE ANALYSIS AND PLANNING OF WATER DISTRIBUTION NETWORKS,

Ring-Belt Ltd. (West Germany); and Montan-

Forschung (West Germany). P. Powell, J. Reitz, and P. A. Ziller.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 98-100, 25-27 September 1973.

*Water distribution(Applied), Networks, *Analog computers, *Analog models, Digital computers, Systems analysis, Planning, Simulation analysis, Pipes, Hazen-Williams equa-

Identifiers: *Hybrid technique.

Described are developments in the use of Analogue computers for the analysis of water distribution networks and the combination of the best of both Analogue and digital techniques in the Hybrid method. In the special purpose, direct Analogue, the flow of current through electronic circuits is used to simulate quantitatively the flow of water through a pipe network. There are three basic types of unit: (1) source units (power supplies); (2) pipe cells (resistance cells); and (3) load cells These units may be connected together to represent a given system by means of a patchboard arrangement. In the Hybrid technique, the digital machine is used where most effectivein handling and presenting all the figures involved in the exercises, e.g., in preparing the data for setting up the Analogue. The digital can cross-check the data and results from the Analogue (and vice versa); moreover, it can check the validity of network simplifications used on the Analogue. (See also W74-12107) (Bell-Cornell) W74-12145

ALLUVIAL GRASSLAND ECOSYSTEMS: HABITAT CHARACTERISTICS,

Ceskoslovenska Akademie Ved, Brno. Botanicka

For primary bibliographic entry see Field 21.

UPPER WABASH SIMULATION MODEL. PRO-GRAM DOCUMENTATION AND EXTENSION, Purdue Univ., Lafayette, Ind. Water Resources Research Center.

S. Tuffuor, D. Lyman, and G. H. Toebes Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 832, tion service, Springfield, Va 22161 as PB-235 832, \$3.25 in paper copy, \$2.25 in microfiche. Purdue University Water Resources Research Center, Technical Progress Report, June 1974. 107 p, 10 tab, 14 fig. OWRT-A-012-IND(6), A-026-IND(4), A-016-IND(4).

Descriptors: *Reservoir operations, *Reservoir management, *Reservoir releases, *Multiple purpose reservoirs, *Simulation analysis, Recreation, Flood control, Reservoir storage, Routing, *Model

Flood control, keservoir storage, Kouting, "Model studies, "Indiana, "Computer programs. Identifiers: "Wabash River(Ind), Reservoir operating policy, Muskingum routing model, Balancing policy, Drainage area ratio policy, Storage volume ratio policy.

A daily simulation model was developed for the Upper Wabash Reservoir River System in Indiana. The motivation for this work was to apply the systems approach to a major river basin with the systems approach to a major river basin with the objective of elucidating water resources planning, management and evaluation questions. The core of this project was a study of reservoir operating rules using a daily quantity simulation model. Three preceding reports outlined the construction of the model and the different operating policies used. This report deals with the documentation of lit the quantity simulation resources. all the quantity simulation programs written to date for the Upper Wabash simulation model. Prior to the documentation effort the Computer programs were written in a more modular form to improve computation efficiency. Computation times were decreased up to 50 percent. An extension to the model, which is not geographic in nature, would be adding a forecast model. This would bring it closer to being a practical tool for reservoir operations. (See also W74-12196) W74-12197

SNOW-AIR INTERACTIONS AND MANAGE-MENT OF MOUNTAIN WATERSHED SNOW-

Colorado State Univ., Fort Collins. Dept. of Earth Resources.

For primary bibliographic entry see Field 2C. W74-12201

MICROWAVES, A NEW TOOL FOR FOREST AND WATERSHED MANAGEMENT,

Montana State Univ., Bozeman. Dept. of Electri-For primary bibliographic entry see Field 7B. W74-12205

FLOOD CONTROL, NAVIGATION, AND OTHER ALTERNATIVE WATER RESOURCES POLICIES IN MINNESOTA,

Minnesota Univ., Minn. Dept. of Agricultural and Applied Economics. or primary bibliographic entry see Field 6F.

W74-12206

AN EVALUATION OF TAILINGS PONDS SEA-LANTS, Robert S. Kerr Environmental Research Lab.,

Ada, Okla. For primary bibliographic entry see Field 5G. W74-12217

MULTIPURPOSE RELATED DEVELOPMENT IN URBAN AREAS, California Univ., Berkeley. Hydraulics Lab. J. A. Harder

Available from the National Technical Informa-Available from the National Technical Service as PB-235 904 \$3.00 in paper copy; \$2.25 in microfiche. Completion Report, May, 1974, 8 p, 2 ref. (California Water Resources Center Project UCAL-WRC-W-289). OWRT-B-

Descriptors: *Flood control, Water manage-ment(Applied), Streamflow, *California, *Cities, *Design flood, Alternative costs, *Multiple-pur-pose projects, Institutional constraints, *Cost sharing, *Federal project policy, Benefits. Identifiers: *San Francisco Bay(Calif).

Four streams in the San Francisco Bay Region were studied from the standpoint of designing flood control systems that would incorporate park recreational benefits in addition to flood control benefits. Such designs were generally more expensive than alternative single purpose flood controls systems. Institutional obstacles to a mul-tipurpose use of stream areas are described. A planning a agency with a broad responsibility is needed to carry out planning for multipurpose use of urban stream areas. Also a change in federal cost sharing regulations would encourage mul-tipurpose use. (Snyder-California, Davis)

AN OPTICAL PLANIMETER FOR LEAF AREA

DETERMINATION,
Georgia Uiv., Athens. Inst. of Ecology., and
Forest Service (USDA), Southeastern Forest Experiment Station. Franklin, N.C. For primary bibliographic entry see Field 2I. W74-12229

TEMPORAL CHANGES IN BIOMASS, SURFACE AREA AND NET PRODUCTION FOR A PINUS STROBUS L. FOREST, Forest Service (USDA), Franklin, N.C. Southeast-

ern Forest Experiment Station. W. T. Swank, and H. T. Schreuder.

w. 1. Swank, and H. 1. Schreuder. In: IUFRO Biomass Studies, International Union of Forest Research Organizations, Working Party on the Mensuration of the Forest Biomass, 1973, of the Mensulation of the Potest Bolhass, 1973, Vancouver British Columbia, Canada, University of Maine at Orono, College of Life Sciences and Agriculture, p 171-182. 2 fig, 5 tab, 11 ref.

Descriptors: *Biomass, *White pine trees, *Primary productivity, Vegetation effects. Evapotranspiration, Identifiers: Plant surface area.

Weighted, linear regression models were used to restimate biomass and surface area of foliage, branches, and stems from tree basal area for a planted white pine stand on a 16.1 hectare watershed. Estimates were made at stand ages 10, 12, and 15 years. During the 5-year period, the stand closure changed from partial to complete and model coefficients showed large changes, particularly for foliage. In February 1972, aboveground biomass for the population was 4,664, 22,825, and 42,110 kilograms per hectare for foliage, branches, and stems. The population of trees contained 9.9, 2.3, and 0.4 hectares of trees contained 9.9, 2.3, and 0.4 hectares of foliage, branches, and stems per hectare of land surface. Net primary production was estimated to be 13,500 kilograms per hectare per year, and foliage development for the pine population culminated when the stand was only 12 years old. Intra- and interspecies comparisons show that data are in the upper range of values reported for forests. Streamflow data for the watershed demonstrate the dynamic nature of changes in stand structure and hydrologic processes.

W74-12231

COMPARISON OF THREE METHODS OF ESTIMATING SURFACE AREA AND BIOMASS FOR A FOREST OF YOUNG EASTERN WHITE

Forest Service (USDA), Franklin, N.C. Southeastern Forest Experiment Station.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

W. T. Swank, and H. T. Schreuder. Forest Science, Vol 20, No 1, p 91-100, March, 1974. 2 fig, 4 tab, 12 ref.

Descriptors: *Biomass, *White pine trees, *Statistics, Regression analysis.
Identifiers: Plant surface area, Foliar.

This paper presents estimates of foliage, branch and stem surface area, and ovendry weight, with estimates of precision of these statistics, for a 10-year-old stand of eastern white pine on a 16-ha watershed at the Coweta Hydrologic Laboratory in the southern Appalachians. Three different methods were used to estimate the forest surface area and biomass: (1) stratified two-phase sampling, (2) two-phase sampling with a regression estimator, and (3) two-phase sampling with a ratioof-means estimator. Stratified two-phase sampling was the most precise and appropriate method; the population was estimated to contain 5.3 ha foliage, 0.76 ha branches, and 0.13 ha stems per hectare of land surface. The estimated ovendry weight of tree components was estimated to be 2.71, 6.83, and 7.01 metric tons per hectare, respectively, for foliage, branches, and stems. The standard error of estimate for surface area and biomass ranged from 5 to 10 percent, depending upon the tree components of interest. W74-12232

ECOSYSTEM MODELING OF A FORESTED RIVER BASIN,

Washington Univ., Seattle. Coll. of Forest Resources For primary bibliographic entry see Field 2A. W74-12294

ADJUSTMENT OF RIVER CHANNEL CAPACI-TY DOWNSTREAM FROM A RESERVOIR. Exeter Univ. (England). Dept. of Geography.
K. J. Gregory, and C. Park.
Water Resources Research, Vol 10, No 4, p 870-

873, August 1974. 3 fig, 14 ref.

Descriptors: *Channel morphology, *Hydrologic aspects, *On-site investigations, *Channel flow, Regulated flow, Discharge(Water), Regime, Rivers, Shape, Slopes, Cross-sections, Peak discharge, Low flow, Hydrology, Surface waters, Drainage area, Reservoir releases, Flow control, Downstream, Reservoirs, Surveys, Hydraulics. Identifiers: Channel capacity adjustment, River Tone(Somerset-United Kingdom), Clatworthy

The construction of a reservoir may provide an opportunity to identify the way in which a changed pattern of river discharge below a dam results in an adjusted channel capacity. This was tested in the basin of the River Tone, Somerset, by comparing channel capacity above and below the Clatworthy reservoir, constructed in 1959. At a number of sites below the dam the channel cross section is multiple in form, the upper element represents the bank-full stage prior to dam construction, and the lower element is the contemporary bank-full level. The reduction of channel capacity downstream from the reservoir persists for a distance of 11 km until the catchment area contributing to the river is at least four times that draining to the reservoir. Peak discharge below the dam is deduced to be approximately 40% of the value that obtained prior to reservoir construction. (Dawes-ISWS) W74-12298

TWO-DIMENSIONAL SEEPAGE IN LAYERED WITH AN UNSTEADY FREE SURFACE,
State Univ. of New York, Stony Brook. For primary bibliographic entry see Field 2G. W74-12315

WATER RESOURCES OF WISCONSIN, LAKE SUPERIOR BASIN, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 7C.

WATER RESOURCES OF WISCONSIN-MENOMINEE-OCONTO-PESHTIGO RIVER

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-12336

FEASIBILITY STUDY TO DEVELOP GUIDELINES FOR LAKE AND RELATED LAND RESOURCE USE DEVELOPMENT RESEARCH, OR ECONOMIC AND ECOLOGICAL IMPACT OF VARIOUS FORMS OF LAKE RESOURCE DEVELOPMENT, New Hampshire Univ., Durham. Water Resource

For primary bibliographic entry see Field 2H. W74-12350

PLANNING AND HUMAN VALUES - AN INQUIRY INTO THE PHENOMENON OF URBAN GROWTH AND THE POSSIBILITY OF ITS CONTROL THROUGH WATER AND LAND RELATED ACTIONS,
Abt Associates, Inc., Cambridge, Mass

For primary bibliographic entry see Field 6B. W74-12354

SOCIAL DIMENSIONS OF URBAN FLOOD CONTROL DECISIONS,

Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources. For primary bibliographic entry see Field 6F. W74-12369

WATER QUALITY IMPROVEMENT OF STRATIFIED IMPOUNDMENTS BY SELECTIVE WITHDRAWAL OF BOTTOM WATERS,

wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5G.
W74-12370

FLOOD PLAIN INFORMATION: KINGSLAND CHESTERFIELD COUNTY, GINIA.

Army Engineer District, Norfolk, Va. Prepared for Chesterfield County, Virginia, April, 1974, 23 p. 7 fig. 6 tab. 11 plates.

Descriptors: *Flood plains, *Flood forecasting, *Flood profiles, Obstruction to flow, Flood data, Land use, Floodproofing, Flood stages, Flood discharge, Planning, Hurricanes, Urbanization, Flood damage, Virginia.

Identifiers: *Kingsland Creek(Virginia).

Identitiers: "Kingsland Creek(Virginia),
'Chesterfield County(Virginia), Richmond(Va),
James River(Va), Falling Creek(Va), Swift
Creek(Va), Intermediate Regional Flood(IRF),
Standard Project Flood(SPF).

The relatively undeveloped and wooded flood plain adjacent to Kingsland Creek is ideal for industrial development as it is only 2 miles south of Richmond and just west of the James River. Gage readings from nearby Falling and Swift Creeks which have similar flood characteristics are used for flood information. Floods caused by heavy rainfalls which are intensified by thunderstorms and hurricanes in summer and fall can be expected in all seasons. Flood flows reach high velocities due to the steep stream gradient caused by the 'fall line' of the Coastal Plain and the Piedmont Plateau. Bridges, culverts, overhanging vegeta-tion, and timber piles on the flood plain create ob-structions to flood flow. A sewage disposal pond poses a potential health hazard. The record flood for Falling and Swift Creeks occurred July 18, 1945 and the most recent major flood occurred June 22, 1972. Discharge for an Intermediate Re-gional Flood (IRF) on the Kingswood would range from 7200 cfs at the mouth to 2090 cfs at the upper reach of the study area at Virginia Route 10; velocity in the main channel would average 3 to 5 ft. per second, with the height of rise at 8.5 ft. In a Standard Project Flood (SPF), the expected range of discharge is 12,590 to 2,910 ft., the average velocity 4 to 6 feet per second, and the height of rise 8.5 ft. Such floods would inundate residential and commercial properties, most significantly damaging the area near U.S. 1-301. Adoption of land use controls to guide flood plain development can be based on the data presented. (Diefendorf-North Carolina) W74-12393

FLOOD PLAIN INFORMATION: OLDTOWN CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA, Army Engineers District, Norfolk, Va.

Prepared for Chesterfield County, March, 1974. 21 p, 7 fig, 4 tab, 11 plates. Virginia:

Descriptors: *Flood plains, *Flood forecasting, *Obstruction to flow, Flood profiles, Flood data, Flood stages, Flood discharge, Flood proofing, Land use, Planning, Hurricanes, Urbanization, Flood damage, *Virginia.

*Oldtown Creek(Virginia), Identifiers: *Chesterfield County(Virginia), Seaboard Coast Appomattox Intermediate Line Railroad, River(Va), Richmond(Va), Intermediate | Flood(IRF), Standard Project Flood(SPF) Regional

Data presented may provide a basis for the adoption of a flood plain ordinance and other regulations which can be used to prevent an increase in damages and further unregulated development in the narrow watershed where residential, municipal and commercial development already exist. In-creasing urbanization of the Richmond area will create pressure for use of the Oldtown Creek flood plain. Oldtown Creek with a drainage area of about 14 square miles flows through the southern portion of Chesterfield County and through the city of Colonial Heights to its confluence with the Appomattox River. Floods caused by rain can be ex-pected in all seasons, with larger floods caused by thunderstorms and hurricanes more likely in summer and fall. Obstructions to flow are created by 14 bridges and the limited capacity of the culvert at Seaboard Coast Line Railroad. Gaging records and newspaper files from streams in the general area indicate that flood stages rise quickly and that flow moves at high velocity. The largest flood in the area occurred in July 1945, the most recent in June 1972. Discharge can be expected to range from 6770 cfs at the mouth to 2100 cfs at the upper limit of the study area in an Intermediate Regional Flood (IRF) and from 12,160 cfs to 2700 cfs in a Standard Project Flood (SPF). Average velocity in the main channel in an IRF would be 2 to 6 ft. per second and 4 to 10 ft. per second in a SPF. Substantial damage to residential property, streets, roads and utilities may be expected from either an IRF or SPF as no flood control structures or flood plain regulations presently exist. (Diefendorf-North Carolina)

FLOOD PLAIN INFORMATION: MAUMEE AND AUGLAIZE RIVERS, DEFIANCE, OHIO, Army Engineers District, Detroit, Mich.

Prepared for the Division of Water of the Ohio Department of Natural Resources, and the Maumee Watershed Conservancy District; 1970, 65 p, 6 fig, 16 tab, 16 plates.

Descriptors: *Flood forecasting, *Flood stages, Flood data, Flood plains, Flood profiles, Flood discharge, Land use, Obstruction of flood flow, Planning, *Ohio.

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

Identifiers: *Maumee River(Ohio), *Auglaize River(Ohio), *Defiance(Ohio), Defiance County(Ohio), Flood plain management, Intermediate Regional Flood(IRF), Standard Project Flood(SPF).

The principal commercial district and a large residential section of Defiance, built in the area between the Maumee and Auglaize Rivers, have been inudated in the past and would be affected by future Standard Project Floods (SPF) and Inter-mediate Regional Floods (IRF) on both rivers. Major floods usually caused by heavy rainfall occur from October to May, with the greatest incidence in February and March. Four bridges on the Maumee and 5 bridges on the Auglaize create obstructions to flood flow. Several islands may also collect ice and debris as additional obstruc tions. The greatest flood occurred in March 1913, with flood discharge approximately 60% greater than the next known discharge. The most recent major flood when water was not affected by river ice was February 16, 1950 with a gage reading of 13.70 ft. on the Maumee and 26.40 ft. on the Auglaize. The Maumee may be expected to rise 5.5 to 6.0 ft. higher in an Intermediate Regional Flood (IRF) and 18.0 to 21.0 ft. higher in a Standard in an Intermediate Regional Flood (IRF) and 18.0 to 21.0 ft. higher in a Standard Project Flood (SPF), the Auglaize 5 to 6 ft. in an IRF and 19.0 to 23.0 ft. in a SPF. The impact of either an IRF or a SPF would be devasting, creating a hazardous situation in developed areas. (Diefendorf-North Carolina)

WAVE ENERGY CONVERTER ARRAY, Laitram Corp., New Orleans, La. For primary bibliographic entry see Field 7B. W74-12438

HYDROLOGICAL REGIME OF LOWER DNIEPER SANDS IN CONNECTION WITH THEIR AFFORESTATION, (IN RUSSIAN), For primary bibliographic entry see Field 2F. W74-12555

BIOLOGICAL CONTROL OF WATER HYACINTH WITH INSECT ENEMIES, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

E. O. Gangstad.

Available from the National Technical Information Service, Springfield, Va 22161 as AD-775 408; \$5.00 in paper copy, \$2.25 in microfiche. Aquatic Plant Control Program Technical Report 6, January 1974. 152 p, 3 fig. 2 tab, 125 ref.

Descriptors: *Biocontrol, *Water hyacinth, *Insects, Aquatic weed control, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Texas, Alligatorweed, Snails, Mites, Environmental effects, Chemcontrol.

Identifiers: Utilization, Flies, Grasshoppers, Moths, Weevils, Manatees, Thrips, Flea beetles.

Because there is little possibility of eradicating the water hyacinth solely by chemical or mechanical methods in many areas of the South Atlantic and Gulf Coast states, various biological control agents are under investigation in cooperation with the USDA Entomology Division and the Corps of Engineers in the United States, Argentina, Uruguay, Trinidad, India, British Guiana, British Honduras and Guatemala. There are indications that real possibilities exist for biocontrol of water hyacinth and investigations are continuing to define the potentiality of various species of flies, caterpillars, weevils, flea beetles, thrips, moths, grasshoppers, and their host specificity. The potential environmental effects of releasing insect importations are discussed. (Auen-Wisconsin) W74-12593

BEECH CREEK, MT. VERNON, OREGON, FLOOD CONTROL CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Walla Walla, Wash. Available from National Technical Information Service, Springfield, Va 22161 as EIS-OR-73-1547-

F. September 26, 1973, 47 p. 9 fig.

Descriptors: *Environmental effects, *Watershed Protection + Flood Prevention Act, *Flood protection, *Channel improvement, *Flood routing, *Oregon, Channels, Water management(Applied), Drainage, Drainage practices, Floods, Economic effects, Federal government, Flood plain zoning, Watershed management, Wildlife habitat, Rivers, Flood damage, Flood control, Runoff, Quarries, Rock excavation, Fish migration, Administrative agencies.

Identifiers: *Environmental Impact Statements, National Environmental Policy Act, *Mt. Vernon(Ore).

The project proposal involves flood channel construction on Beech Creek for the protection of the city of Mt. Vernon, Oregon, and flood plain zoning in unprotected areas upstream and downstream from the city. Serious flooding has occurred during the winter months causing costly damage to the residential and commercial areas through which Beech Creek flows. Besides providing flood protection the work would modify the appearance of the existing channel and will require provision of a fish-way to accommodate the annual fish migration. The displacement of existing streambank vegetation and wildlife, the need for a rock quarry and the temporary disturbances in the community during construction activity constitute the adverse effects of the project. The alternatives include an upstream storage project, flood plain zoning alone or no action. These were not feasible because of their expense or inefficiency. The rock quarry site, materials, labor, and four acres of land suitable for homesites would be irreversibly committed. Comments were received from local, county, state and federal interest groups. (Dillingham-Florida) W74-12599

BAKER LAKE WATERSHED PROJECT, FAL-LON COUNTY, MONTANA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Soil Conservation Service, Bozeman, Mont.

Soil Conservation Service, Bozeman, Mont. Available from the National Technical Information Service, Springfield, Va. 22161 as EIS-MT-73-1327-F. August 13, 1973. 50 p, 1 tab, 3 map.

Descriptors: *Environmental effects, *Dam construction, *Montana, *Federal government, Land management, Water management(Applied), Dams, Watersheds(Basins), Flooding, Flood control, Sediment control, Erosion control, Watershed management, Runoff, Soil conservation, Water resources development, Rocky Mountain region.

Identifiers: *Environmental Impact Statements,

*Administrative regulation, *Baker Lake, Mont.

This project involves construction of a single-purpose floodwater retarding structure and land conservation treatment measures. It is designed to protect the city of Baker and Baker Lake, in southeastern Montana, from floodwater and sediment damage. The region is semiarid and is used primarily for rangeland and oil wells. The watershed includes most of the city. The project will reduce floodwater and sediment damage, enhance opportunities for future reclamation of Baker Lake, reduce sediment production and runoff from the watershed. Some plant species and wildlife habitat will be lost, and the potential hazard of soil waste pollution in the basin will be increased. Alternatives considered were: land treatment along, alternative structural measures, floodproofing, channeling and diking, land use regulation, flood plain insurance, and no project action. Land use patterns are stable and expected to remain unchanged. 185 acres, mostly rangeland, will be irrevokably committed to project use. The

public and other governmental agencies generally support the project. (Deckert-Florida) W74-12601

AUTHORIZING THE SECRETARY OF THE IN-TERIOR TO CONSTRUCT, OPERATE, AND MAINTAIN THE NARROWS UNIT, MISSOURI RIVER BASIN PROJECT, COLORADO, AND FOR OTHER PURPOSES.

Committee on Interior and Insular Affairs (U.S. House). For primary bibliographic entry see Field 6E. W74-12609

W74-12609

AUTHORIZING AND PROVIDING FOR CON-STRUCTION OF A WATER DISTRIBUTION SYSTEM AND A WATER SUPPLY FOR THE SOBOBA INDIAN RESERVATION. Committee on Interior and Insular Affairs (U.S.

For primary bibliographic entry see Field 6E. W74-12612

WATERSHED PROJECTS. For primary bibliographic entry see Field 4D. W74-12622

SOWASHEE CREEK WATERSHED, LAU-DERDALE COUNTY, MISSISSIPPI (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C.

Soil Conservation Service, Washington, D.C. Available from NTIS, Springfield, Va. 22161 as EIS-MS-73-1716-F. October 29, 1973. 84 p, 1 tab, 2 map.

Descriptors: *Environmental effects, *Multi-purpose projects, *Federal government, *Mississippi, Water management(Applied), Land management, Dams, Watersheds(Basins), Dam construction, Flooding, Flood control, Sediment control, Chanel improvement, Erosion control, Watershed management, Gulf coastal plain, Recreation facilities, Recreation, Reservoir construction, Reservoirs.

Identifiers: *Environmental impact statement, *Administrative regulations, *Meridan, Miss.

This project is to solve problems of erosion, sedimentation, flooding, and inadequate recreational facilities in the Sowashee Creek Watershed. The city of Meridian, Mississippi is particularly affected by this project. The plans call for conservation land treatment measures, single-purpose floodwater retarding structures, a multi-purpose structure for floodwater retardation, channel modifications, and basic recreation facilities. Sheet erosion occurs on most of the land in the watershed. Damaging flooding occurs as often as four times per year in some of the low-lying areas. The project will reduce flooding, erosion, and sediment deposition and will create fishery and waterfowl habitat. The proposed project is the most feasible of the various combinations of the plan's components that were considered. The effects upon long-term use of resources is minimal. While some concern is expressed by various agencies respecting the channel modification called for in the plan, reaction to the program is generally favorable. (Deckert-Florida) W74-12626

MAP SHOWING DRAINAGE AREAS, WARREN QUADRANGLE, MASSACHUSETTS, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C. W74-12643

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1972 - NOVEMBER 30, 1973. Office of Delaware River Master, Milford, Pa. U.S. Geological Survey Report, May 1974. 82 p, 3 fig. 1 plate, 19 tab.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 4B

Descriptors: *Delaware River Basin Commission, *Delaware River, *Streamflow, *Water management(Applied), Water quality, Monitoring, River basin development.

The twentieth Annual Report of the River Master of the Delaware River covers the year December 1, 1972 to November 30, 1973. The year was generally above normal from a hydrologic standpoint. Precipitation was excessive. The annual flow of Delaware River at Montague, N. J., adjusted for diversions and changes in reservoir storage was about 40% above median and the third highest of record. Intense, heavy rains caused flash floods on streams tributary to the upper Delaware River June 29 and 30. Storage of reser-Delaware River June 29 and 30. Storage of reservoirs during the year decreased from 76.0% in December, 1972, and on November 30, 1973, the combined storage was 57.0% of capacity. The maximum combined storage during the year was 104.7% of capacity (June 30). The minimum was 57.0% of capacity (November 30). Diversion by New York City did not exceed the legal limit. Diversions through the Delaware and Raritan Canal in New Jersey did not exceed limits. Data are presented showing the extent of salinity invasion and other water-quality characteristics during the report year. The gaging station at Montague continues participation in the Earth Resources Technology Satellite program by transmitting river stage data. Other sites that have been activated monitor water quality data, groundwater eleva-tions, and stream stages. Data is transmitted from the ERTS-1 satellite to Goddard Space Flight Center, Greenbelt, Md., and by landline to the Pennsylvania District Water Resources Center for processing. (Knapp-USGS) W74-12634

METEOROLOGICAL CRITERIA FOR EXTREME FLOODS FOR FOUR BASINS IN THE TENNESSEE AND CUMBERLAND RIVER WATERSHEDS,

MALEASHELDS, National Weather Service, Silver Spring, Md. Hydrometeorological Branch. For primary bibliographic entry see Field 2B. W74-12636

SAVANNAH MUCK DIKES--RESTORATION FEASIBILITY STUDY.

Weaver Enterprises, Waterloo, N.Y.
For primary bibliographic entry see Field 8A.

4B. Groundwater Management

HYDROLOGIC CONSEQUENCES OF USING GROUNDWATER TO MAINTAIN LAKE LEVELS AFFECTED BY WATER WELLS NEAR

TAMPA, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. W. Stewart, and G. H. Hughes. Open-file report 74006, 1974. 67 p, 20 fig, 2 tab, 3

Descriptors: *Lakes, *Florida, *Surface-ground-water relationships, Withdrawal, Pumping, Infil-tration, Water levels, Water level fluctuations, Groundwater movement, Water wells. Identifiers: *Tampa(Florida).

Extreme declines in lake levels near Tampa, Florida have been forestalled since 1966 at Round Lake and since 1968 at Charles and Saddleback Lakes by pumping water from the Floridan Aquifer into the lakes. Levels are maintained at a nearly constant stage slightly below the altitude at nearly constant stage signity below the attitude at which the lakes begin to overflow and generally above the altitude that the lake levels would have attained naturally. The pumping compensates for the lowering of the water table caused by pumping for public water supply and below-normal rainfall. Combined pumpage into the three lakes averaged 765 gpm during 1971. During 1971, rainfall was

about equal to lake evaporation so the water pumped into the lakes was used entirely to replace water that leaked from the lakes into the local aquifer system. Almost all leakage eventually returned to the Floridan Aquifer. The estimated increase in lake evaporation attributable to maintaining the lake levels against the effects of pumping for public water supply and below normal rainfall would have been 25 gpm for the three lakes or 3% of the groundwater input for 1971. Adding groundof the groundwater input for 1971. Adding ground-water to the lakes caused a distinct change in the chemical quality of the lake water, generally characterized by increases in calcium, bicar-bonate, hardness, and alkalinity. However, many lakes in Florida are naturally supplied with the same kind of groundwater; hence, any long-term ecological changes are not expected to be drastic or harmful. Further study will be needed to document whether any long-term ecological changes are likely to occur. (Knapp-USGS) W74-12013

DEVELOPMENT OF WATER FROM FRAC-TURED CRYSTALLINE ROCKS, REPUBLIC OF KOREA,

Ministry of Construction, Seoul (Republic of

Korea). J. T. Callahan, and Seung Il Choi.

Reprint of paper presented at the 2nd International Convention on Groundwater (Atti Del 2 Convegno Internazionale Sulle Acque Scotterranee), Paler-mo, Italy, April 28-May 2, 1973. 20 p, 5 fig, 3 tab, 5

*Hydrogeology, Descriptors: *Groundwater. development. Water resources *Fractures(Geologic), Granite rocks, Water yield, Water wells. Identifiers: *Korea. Granites, Metamorphic

The development of water from crystalline rocks, in the Republic of Korea, has been limited to a relatively few places. Wells were drilled to supple-ment a few public water supplies in 1960 and 1961 and for the extraction of thermal water at hot and for the extraction of thermal water at not springs resorts beginning in the early 1920's. More than 130 water wells were drilled in all types of crystalline rocks from 1966 to 1971. Wells drilled on favorable geologic structures, intersecting joints, fractures, and faults, and solution zones in thin limestone beds have a better change of yielding large volumes of water than those drilled at random sites. The depth of weathering of crystalline rocks and the topographic location appear to influence the sustained yield of wells. Wells in areas of low relief and deep weathering in the western part of the peninsula yield larger volumes of water on a sustained basis than those in the central mountainous areas. Weathering to depths of 25 meters is not uncommon, and weathered zones in granite and schist interbedded with limestone were encountered in wells to depths of more than 60 me-ters. Based on low-flow measurements of major and minor tributaries in the Han River basin during the dry seasons, individual subbasin groundwater the dry seasons, individual subvasing ground-mac-outflow from crystalline rocks ranged from 500 cu m/day to more than 1,000 cu m/day per square kilometer. Streams in basins underlain by granite flowed more consistently than stream underlain by other rock types during periods of drought. The chemical quality of groundwater in crystalline rocks is satisfactory for most purposes. Dissolved solids generally are less than 300 milligrams per liter. (Knapp-USGS)

SOME DATA ON MOVEMENT OF RADIOSTRONTIUM WITH GROUNDWATER CUR-

For primary bibliographic entry see Field 5B. W74-12040

GROUNDWATER RESOURCES OF THE HOL-LYWOOD AREA, FLORIDA, Geological Survey, Tallahassee, Fla.

H. W. Bearden.

Open-File report FL-74015, 1974. 71 p, 17 fig, 5 tah 21 ref

Descriptors: *Groundwater, *Hydrogeology, *Saline water intrusion, *Florida, Water utilization, Withdrawal, Municipal water, Water quality, Water levels, Drawdown, Transmissivity, Identifiers: *Hollywood(Fla).

Freshwater for all purposes in Hollywood, Florida, is derived from the highly permeable Biscayne aquifer. The aquifer is composed chiefly of permeable beds of limestone, sandstone, and sand that extend from land surface to a depth of about 200 feet. Water levels in the aquifer fluctuate chiefly in response to rainfall, the major source of recharge. The water table slopes gently from the west and averages about 1.0 foot higher in the western part of the city than in the eastern part. The configuration of the water table is greatly in-fluenced by Hollywood Canal and the ocean. Because the permeability of the aquifer is high, the effect of pumping of wells is dispersed over a large area and drawdowns are about 0.1 foot. Saltwater intrusion from Hollywood Canal is the chief threat to the groundwater supply in Hollywood. When discharge is low, the chloride concentration of water in the canal has reached levels greater than 10,000 mg/liter. Saltwater has been detected in the aquifer at depth within 0.1 mile of the municipal wells. Groundwater of good quality is available in the western part of the Hollywood area. Because transmissivity of the Biscayne aquifer is high, with proper planning additional quantities of water can be obtained without affecting water levels sig-nificantly in existing wells. (Knapp-USGS) W74-12054

WATER RESOURCES OF THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 7C. W74-12056

GROUNDWATER RESOURCES OF YELLOW CREEK STATE INLAND PORT AREA, TISHOMINGO COUNTY, MISSISSIPPI,

Geological Survey, Jackson, Miss. E. H. Boswell, and B. E. Wasson. Yellow Creek State Inland Port Authority, Mississippi, Publication, 1974. 19 p. 1 fig. 1 tab, 9 ref.

Descriptors: *Groundwater, *Water yield,
*Mississippi, *Industrial water, Water supply,
Aquifers, Water resources development, Industrial plants, Data collections, Hydrologic data.
Identifiers: *Yellow Creek Inland Port(Miss).

At the Yellow Creek State Inland Port Industrial Area, Mississippi, substantial quantities of groundwater are available for industrial use. Test drilling at five sites resulted in successful test wells at two sites. The aquifer is in chert and hydraulically connected gravel. Test pumping in-dicated that wells capable of yielding about 1 mil-lion gallons per day could be constructed at each of the two sites. Water produced by the test wells was soft and contained less than 50 milligrams per liter of dissolved solids. The iron content was l than 0.3 mg/liter and the average pH was 5.5. (Knapp-USGS) W74-12059

HYDROGEOLOGIC DATA FROM GREELEY, WICHITA, SCOTT AND LANE COUNTIES,

KANSAS, Geological Survey, Garden City, Kan. L. E. Stullken, E. C. Weakly, E. D. Gutentag, and S. E. Slagle.

Kansas Geological Survey Basic-Data Series Ground-Water Release No 4, 1974. 58 p, 1 fig, 1 plate, 4 tab.

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

Descriptors: *Basic data collections, *Hydrologic data, *Groundwater, *Kansas, Water wells, Aquifers, Water yield, Data collections. Identifiers: *Greeley County(Kans), *Wichita County(Kans), *Scott County(Kans), *Lane

Records of 2,012 wells in Greeley, Wichita, Scott, and Lane Counties, Kansas, are presented. Included are 1.901 irrigation, 38 domestic or stock, titude are 1,50 infigation, 38 domestic to stock, 40 industrial or public supply, and 33 other wells. Chemical analyses from 133 representative wells are listed in this release. Lithologic logs of 104 test holes also are included. Groundwater withdrawal has increased concurrently with the number of wells in use. The number of irrigation wells in Greeley County increased from about 10 to 212 during 1951-72, the number of Wichita County increased from 70 to 808 during 1951-72, the number in Scott County increased from about 130 to 717 during 1945-72, and the number of Lane County increased from 5 to 164 during 1949-72. Yields to irrigation wells range from 100 to 2,000 gpm from the Ogallala Formation of Pliocene age and from 250 to 1,500 gpm from the alluvium and undifferentiated deposits of Pleistocene age. As much as 1,000 gpm of water may be available to wells in local areas from fractures and solution openings in the Niebrara Chalk. Yields of 30 to 300 gpm may be available from sandstone beds in the undifferentiated rocks (mainly Dakota Formation) of Early Cretaceous age. (Knapp-USGS) W74-12068

AVAILABILITY OF GROUNDWATER FOR THE U.S. NAVY WELL FIELD NEAR FLORIDA CITY, DADE COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla.

F. W. Meyer.

Open-file report FL74014, 1974. 50 p, 18 fig, 1 tab, 13 ref

Descriptors: *Groundwater, *Water yield, *Water resources development, *Military reservations, *Florida, Withdrawal, Analog models, Conjunctive use, Artificial recharge, Saline water intru-

Identifiers: *Florida City(Fla).

Enough groundwater is available in southeastern Dade County so that the U. S. Navy facilities at Key West can increase withdrawal from 6 million gallons per day to 18 million gallons per day. It is planned that future water requirements in southeastern Dade County--beyond the 18-milliongallon-per-day demand--be met chiefly by recharge from a pump-equipped conveyance canal for Conservation Area 3. An electrical analog model of the Biscayne aquifer, constructed in cooperation with the Central and Southern Florida Flood Control District was used to predict the effects that increased well-field pumpage would have on water levels. (Knapp-USGS) W74-12076

CANADIAN HYDRAULICS CON-FERENCE PROCEEDINGS.

Alberta Univ., Edmonton. Dept. of Civil Engineer-

For primary bibliographic entry see Field 8B. W74-12087

CONTROL OF SEA WATER INTRUSION BY SALTWATER PUMPING--A MATHEMATICAL MODEL

MacLaren (James F.) Willowdale (Ontario). For primary bibliographic entry see Field 5G. W74-12102

NUMERICAL ANALYSIS OF GROUNDWATER FLOWS, FENCO, Toronto (Ontario).

G. D. Ransford.

In: Proceedings of Canadian Society for Civil Enin: Proceedings of Canadian Society for Civil Zingineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 378-393, 1973. 4 fig, 5 ref.

*Groundwater Descriptors: movement. *Numerical analysis, *Computer programs, *Aquifer testing, *Uplift pressure, Sheet piling, Seepage, Aquifer characteristics, Simulation anal-

Numerical analysis methods are discussed for analysis of well pumping tests to determine aquifer properties when the pumped discharge is not con-stant, analysis of flow into a circular sheet pile cofferdam driver into permeable material, and uplift under structures such as gravity dams or caissons, when well points are used for pressure relief. Charny's theorem enables the average uplift across a section to be calculated more readily than the uplift at individual points. The surfaces of the sheet piling and of the excavation within the cofferdam are simulated by ring vortices and by dis-tributed sinks. Computer programs are presented for the problems. The case of a leaky aquifer is treated by evaluating the Hantush and Jacob leaky aquifer function. A computer program is given for drain design. (See also W74-12087) (Knapp-USGS) W74-12104

THE APPLICATION OF A SIMULATION MODEL TO THE PLANNING AND MANAGE-MENT OF WATER RESOURCES IN LAN-CASHIRE.

Lancashire River Authority (England). P. D. Walsh.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 56-59, 25-27 September 1973. 1 fig, 2 tab, 3 ref.

*Water resources development, Descriptors: *Planning, *Management, *Simulation analysis, *Computer models, Computer programs, Water supply, Conjunctive use, Hydrologic data, Reservoirs, Sandstone, Aquifers, Rivers, Withdrawal, Operations, Inflow, Wells, Constraints, Systems analysis Identifiers: River authorities, Yield

Several reservoirs and a sandstone aquifer are used conjunctively in a water supply scheme. One of the reservoirs and the aquifer are capable of further development and the yield of the system may be further increased by river abstractions. Described is the simulation model developed to in-

vestigate the yield of the scheme and the ways in which the system might be operated. The model accepts 46 years of data; pentad data is used for the reservoir inflows and mean daily flows for the rivers. All system parameters, license conditions and operating policies are specified as data for each run of the model. The program contains a each run of the model. The program contains a number of output options, enabling different aspects of the system to be examined in detail. Output can be produced on an annual, monthly or daily basis. Through subsidiary programs, frequency analysis, graph plots, or listings of daily results may be produced. In future, this model will study system performance and operation during the construction period when demands on the system might exceed the available supplies. (See also W74-12107) (Bell-Cornell) W74-12136

HYDRODYNAMICS OF ARTIFICIAL GROUND-WATER RECHARGE,

California Univ., Irvine. School of Engineering. R. R. Brock.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 831, \$4.75 in paper copy, \$2.25 microfiche. Completion Report, February 1974. 135 p, 88 fig. 11 tab, 15 ref. OWRT C-3112(3687)(2), 14-31-001-3687.

Descriptors: *Artificial recharge, *Dupuit-Forchheimer theory, *Groundwater recharge, Hydrodynamics, Potential flow, Recharge ponds, *Porous media, Saturated flow, Water spreading, *Water table aquifers, Perched water, Laboratory tests. California, *Groundwater movement.

Identifiers: Perched recharge mounds, Semipervi-ous layers, Sand models, Potential Theory, Strip basin, Square basin.

Ground-water recharge to a horizontal water table and to a semipervious layer were investigated. The saturated flow equations for a homogeneous isotropic medium were used to find theoretical solutions. Experiments were conducted in a laboratory sand model. Field observations of

recharge mounds developed beneath square ponds near Fresno, Calif., were also utilized. For the horizontal water-table case the classical Dupuit-Forchheimer (D-F) theory and the more exact potential (P) theory were used. For each theory a linear (L) and nonlinear (NL) version were used. Solutions for a dimensionless water-table rise were obtained using the LDF, NLDF, LP and NLP theories for a strip basin. Most of these were obtained by a finite-difference solution of the equations. For a square basin the LDF and NLDF theory were used. In general it was found that for a shallow flow (which occurs when the ratio of inishall be that the basin width is sufficiently small) and small water-table rise the LDGF theory is valid, whereas for larger rises the nonlinear effects are important and the NLDF theory must be used. The laboratory results for shallow flows were in close agreement with the NLDF theory. For deep flows the D-F theories are inadequate and the potential theories must be used. The NLP theory was used to obtain detailed flow patterns for both a shallow and deep flow case. For perched mounds on a semi-pervious layer the NLDF theory was used to develop solutions for the mound shape for strip and square basins. Laboratory experiints for steady state perched mounds beneath a strip basin were conducted in a sand model. For small leakage rates the NLDF theory compares favorably with the experimental results. For large leakage rates the NLDF theory is not adequate, probably because of relatively large vertical velocities. A method was developed to determine the permeabilities of the semi-pervious layer and sand above the layer from observed steady-state mound shapes and recharge rates. The method is illustrated with field data from a square pond. W74-12195

MULTILEVEL OPTIMIZATION FOR CON-JUNCTIVE USE OF GROUNDWATER AND SURFACE WATER,

Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center.

Yu, and Y. Y. Haimes. Water Resources Research, Vol 10, No 4, p 625-636, August 1974. 7 fig, 6 tab, 22 ref, 2 append.

Descriptors: *Conjunctive use, *Systems analysis, Descriptors: Confidential Systems and Syst

Recharge, Imported water, Irrigation water, Industrial water.

Identifiers: *Regional authority, *Multilevel systems, *Local water agency, Pumping tax, Agricultural demand, Management models, Asymmetrical grid network model.

A general systems analysis approach, not using straight simulation methods, was applied to the problem of optimal conjunctive use of groundwater, local surface water, and imported water resources. A water resources management problem was considered for a hypothetical region composed of several adjoining subregions overly-ing a common aquifer. The aquifer was represented by a two-dimensional asymmetrical grid network model. Local water agencies had exclusive rights for developing and controlling all water resources in its subregion. Water demands

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 4B

for each subregion were classified as agricultural or municipale industrial. A regional water authority optimally regulated the region's water resources by establishing intersubregional aquifer boundary conditions, and by imposing a pumping tax to pay the cost of recharging the aquifer. The solution was implemented by a completely decentralized decision making structure of two level hierarchy. (Adams-ISWS) W74-12296

SEEPAGE RATES AND THE HORIZONTAL FLOW APPROXIMATION,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics. For primary bibliographic entry see Field 8D. W74-12297

TRACING SHALLOW GROUNDWATER SYSTEMS BY SOIL TEMPERATURES. Illinois State Geological Survey, Urbana For primary bibliographic entry see Field 2F.

WATER QUALITY AND POLLUTION--SOUTH FORK OF LONG ISLAND, NEW YORK, Wisconsin Univ., Oshkosh. Dept. of Geology. For primary bibliographic entry see Field 5B.

DATA FROM CONTROLLED DRILLING PRO-GRAM IN LEE AND OGLE COUNTIES, IL-LINOIS.

Illinois State Geological Survey, Urbana P. C. Reed. Environmental Geology Notes, No 71, August

1974. 40 p, 2 fig, 2 tab, 1 append.

Descriptors: *Illinois, *On-site data collections, *Subsurface investigations, *Groundwater resources, *Basic data collections, Exploration, Drill holes, Rotary drilling, Drillers logs, Sieve analysis, Seismic studies, Groundwater. Identifiers: Lee County(Ill), Ogle County(Ill), Field data.

Descriptions of the character and sequence of materials and tables listing their relative density, consistency, moisture content, and size analyses were presented for glacial materials sampled and tested as part of a controlled drilling program for groundwater exploration at seven sites in Lee County and one site in Ogle County, Illinois. The results of 16 refraction seismograph profiles and preliminary data from a pumping test at one test-hole site were also given for Lee County. (Humphreys-ISWS) W74-12317

GHANATS OF IRAN: DRAINAGE OF SLOPING

AQUIFER, Iranian Plan and Budget Organization, Tehran. Technical Bureau. M. Bybordi.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 100, No IR3, Proceedings Paper 10785, p 245-253, Sep-tember 1974. 4 fig, 18 ref, 2 append.

aquifers, *Dramage, *Groundwater, *Alluvial Descriptors: systems, "Subsurface drainage, "Groundwater, systems, "Subsurface drainage, "Groundwater, "Irrigation, Darcys Law, Water table, Tunneling, Tunnel construction, Conduits.
Identifiers: "Ghanats, "Iran.

The Ghanats of Iran are one of the oldest systems of water supply in the world. A Ghanat is a subsurface drain that brings mountain groundwater to arid plains by means of a man made gravity flow channel. The estimated 50,000 Ghanats in Iran provide from 1/3 to 1/2 of all irrigation water in the country. Their features and construction methods were described. As a Ghanat behaves like a drain, its dicharge is proportional to the length of its wet part and to the difference of head existing between the axis of the tunnel and the regional water table. The actual complex flow conditions of a Ghanat must be simplified to obtain an approximate solution for the transient water table. A simplified approximate theory based on Darcy's Law was presented and the resulting equations were evaluated in terms of different parameters for two representative cases. (Sanderson-ISWS) W74-12318

WATER RESOURCES OF WISCONSIN, LAKE

SUPERIOR BASIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C. W74-12335

WATER RESOURCES OF WISCONSIN-MENOMINEE-OCONTO-PESHTIGO

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 7C. W74-12336

GEOHYDROLOGY OF THE PARKER-BLYTHE-CIBOLA AREA, ARIZONA AND CALIFORNIA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 2F. W74-12339

WATER PRICING DURING URBAN DEVELOP-MENT

Pennsylvania State Univ., University Park. Dept. of Agricultural Economics and Rural Sociology. For primary bibliographic entry see Field 6C W74-12366

ANALYSIS OF ELECTRICAL RESISTIVITY MEASUREMENTS OF SHALLOW DEPOSITS, Iowa State Univ. of Science and Technology,

For primary bibliographic entry see Field 8G.

INDUCED INFILTRATION AT THE UNIVERSI-TY OF CONNECTICUT WELL FIELD. Connecticut Univ., Storrs.

M. T. Giddings. M Sc thesis, 1966. 35 p, 9 fig, 1 tab, 20 ref, append.

Descriptors: Rivers, *Groundwater, Underflow, Alluvium, Pump testing, *Induced infiltration, *Connecticut.
Identifiers: *Fenton River(Conn), Outwash, Ice-

contact deposits, Recharge boundary.

Flow measurements of the Fenton River made during a 21 day study period suggest that the river loss due to induced infiltration to the adjacent well field varies with the pumpage from the well field. The aquifer unity supplying the well field is composed of alluvium, outwash, and ice-contact deposits. Ground water underflow percolating downvalley through this aquifer unit provides a part of the water pumped from the well field. The balance of the water pumped is supplied by duced infiltration from the Fenton River. Water table levels measured during the study period also show fluctuations corresponding to pumpage fluc-tuations. Additional pump test data indicate that the Fenton River is a recharge boundary for the aquifer unit. Calculations based on the river loss measured during the 21 day study period indicate that an average of 40% of the water pumped from the University of Connecticut well field is derived from the Fenton River by induced infiltration. The lowering of the water table by pumping the wells located near the river induces the infiltration of river water into the underlying aquifer unit. Induced infiltration at the University of Connecticut well field causes a decrease in the flow of the Fenton River it passes the well field. (Campbell-W74-12529

ANALYSIS OF PUMPING WELL NEAR A STREAM.

Arizona Univ., Tucson. S A Bhatti

M Sc thesis, 1967. 103 p, 17 fig, 13 tab, 23 ref, 5 ap-

Descriptors: *Aquifer characteristics, Streams, *Pump testing, Infiltration, *Drawdown, Salinity, Irrigation, *Groundwater, Specific yield. Identifiers: *Tube well discharge, Water-logging, Coefficient of transmissibility, Coefficient of storage, Surface water-ground water relationships.

A pumping test was conducted to evaluate aquifer characteristics, the percentage of tube well discharge derived from the stream, and the effective distance to the stream simulated as a fully penetrating plane source of constant head. The formulae are applicable although a natural stream is seldom fully penetrating, because the distance from the stream to an equivalent fully penetrating but imaginary plane source can be calculated. When pumping begins, the tube well contains most of its water from the immediate vicinity, but as the cone of influence expands, it receives a part of its water from the stream until a time is reached when it draws the entire amount of water from the stream. This will of course, depend upon the aquifer characteristics, the tube well discharge, distance of the tube well from stream and the infiltration regimen of the stream. Different methods were used to find the distance of stream equivalent to a fully penetrating plane source, the determina-tion of coefficient of transmissibility and coefficient of storage, and, the amount of water that the tube well intercepts from the stream. (Campbell-W74-12531

CAN FREEZING IMPROVE WELLS IN CON-SOLIDATED ROCK AQUIFERS,

Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Develop-

D. J. Burdon.

Johnson Drillers Journal, p 5, May-June, 1974.

Descriptors: Aquifer management, Confined aquifers, Consolidation, Storage capacity, *Groundwater, Fissures(Geologic), Cracks, Ex-pansion joints, Irrigation systems, Irrigation wells, *Freezing, Boreholes, Crystallinization, Fractures(Geologic).
Identifiers: *Consolidated rock aquifers, Joint-fis-

sure systems.

Finding ways to increase aquifer storage capacity and yield from wells that tap consolidated rock aquifers is more necessary than ever in some areas of the world where food production must be constantly increased. Freezing the groundwater within the joints and fissures of jointed-fractured rock has some possibility of attaining these ends. Water expands as it freezes. Use of this means to open up and to extend existing joints and fissures appears to be a new concept. It is suggested that by freezing the groundwater in and around the groundwater extraction structure, the expansion of the water will open up the joints, cracks, and fissures. Even though some reclosing of the joints seems likely, the operation will increase the storage capacity of the rock reservoir around the well and allow more water to be pumped each year. New approaches are required and should be tested. The idea presented appears to merit a further study of existing data and methods, followed by identification and testing of approaches which can be considered likely to yield positive results. (Campbell-NWWA)

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

THE COST OF GROUNDWATER VS. SURFACE WATER.

Moody and Associates, Meadville, Pa. J. F. Howard.

Water Well Jornal, Vol 28, No 8, p 35-37, August,

Descriptors: *Cost comparisons, Groundwater, Descriptors: *Cost comparisons, Groundwater, *Groundwater availability, *Decision making, Management, Cost allocation, Economics, Planning, Programs, Water wells, Drilling, Aquifer testing, Aquifer management, Groundwater resources, *Groundwater potential, Cost-benefit analysis, Distribution systems, Maintenance costs, *Surface waters, Municipal water. Identifiers: Capital expenditures, Production costs, Financial implementation.

The normal sequence of decision-making involved in planning the development of large volume water supplies needed to meet rising industrial or municipal demands has, in the past, badly underesti-mated groundwater as a reliable low-cost water resource. The greater visibility, aesthetic appeal, and so-called multiple-use concepts of lakes and surface water bodies combined with an un-deserved groundwater reputation for unreliability has produced a general philosophical orientation toward the use of surface supplies by those responsible for determining the best long-term source available. Most of the reputation concerning groundwater unreliability is due to a low level of awareness concerning the groundwater system, its controls, and its advantages on the part of many of those involved in the decision-making process. The question of reliability has risen primarily those areas where proper utilization of the procedures necessary for accurate evaluation and establishment of well-field management plans have not been employed. The overall advantages of groundwater as a longterm water supply source are overwhelming. A few of the more significant facets are described: total reserves, lower contamination potential, physico-chemical stability of groundwater, cost-benefit considerations. groundwater, co (Campbell-NWWA) W74-12535

HOW TO DIAGNOSE A THIEF ZONE, Continental Oil Co., Ponca City, Okla. For primary bibliographic entry see Field 8G.

FILTRATION OF OILFIELD PRODUCED WATERS.

For primary bibliographic entry see Field 5D. W74-12539

HYDROLOGY OF RADIOACTIVE-WASTE DISPOSAL AT THE IDAHO CHEMICAL PROCESSING PLANT, NATIONAL REACTOR TESTING STATION, IDAHO, For primary bibliographic entry see Field 5E. W74-12546

WHAT EXPLORATION GEOLOGISTS SHOULD

KNOW ABOUT POLLUTION,
Texas Univ., Austin. Center for Research in Water Resources.

For primary bibliographic entry see Field 5B.

TIDAL FLUCTUATIONS OF WATER LEVELS IN WELLS IN CRYSTALLINE ROCKS IN NORTH GEORGIA,

For primary bibliographic entry see Field 2F. W74-12551

MAP SHOWING DEPTH TO BEDROCK, HART-FORD SOUTH QUADRANGLE, CONNEC-

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W74-12627

CONTOUR MAP OF THE BEDROCK SUR-FACE, TARIFFVILLE QUADRANGLE, CON-NECTICUT-MASSACHUSETTS, Geological Survey, Hartford, Conn For primary bibliographic entry see Field 7C. W74-12628

MAP SHOWING DEPTH TO BEDROCK, OLD LYME QUADRANGLE, CONNECTICUT, Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C. W74-12629

CONTOUR MAP OF THE BEDROCK SURFACE, GLASTONBURY QUADRANGLE, CON-Geological Survey, Hartford, Conn.

For primary bibliographic entry see Field 7C. W74-12630

CONTOUR MAP OF THE BEDROCK SUR-FACE, ELLINGTON QUADRANGLE, CONNEC-

Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 7C.

MAP SHOWING AVAILABILITY OF GROUND-WATER, WARREN QUADRANGLE, MAS-SACHUSETTS,

Geological Survey, Boston, Mass. For primary bibliographic entry see Field 7C. W74-12632

A GROUNDWATER INVESTIGATION OF THE LUMMI INDIAN RESERVATION, WASHING-

Geological Survey, Tacoma, Wash D. R. Cline.

Open-File Report, 1974. 66 p, 9 fig, 5 tab, 11 ref, append.

Descriptors: *Groundwater, *Water resources, *Indian reservations, *Washington, Aquifers, Water yield, Water quality, Water supply, Saline water intrusion.
Identifiers: *Lummi Indian Reservation(Wash).

Both fresh and daily groundwater underlie the Lummi Indian reservation, Washington. This water is sometimes stratified, with the freshwater lying above the salty water. Significant quantities of fresh groundwater are found beneath Lummi Peninsula and beneath the western part of the reservation. The yields of wells range from less than 1 to 400 gallons per minute. The two most promising areas for the development of additional groundwater supplies are in the western part of the reservation just southeast of Neptune Beach, and the central part of Lummi Peninsula. Although serious saltwater intrusion has not yet been detected on the reservation, some wells may be showing the first signs of it, such as at Gooseberry Point. There, the chloride content of the water from the two public-supply wells has been slowly increasing, from 24 milligrams per liter in 1968 to 110 milligrams per liter in 1972. The quantity of groundwater withdrawn on the reservation in 1972 was about 41 million gallons, about double that in 1965. The fresh groundwater is generally of good quality. (Knapp-USGS) W74-12635

GROUNDWATER POLLUTION IN THE VICINI-TY OF TOLEDO BEND RESERVOIR, TEXAS, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 5B.

APPRAISAL OF OPERATING EFFICIENCY OF RECHARGE BASINS ON LONG ISLAND, NEW

RECHARGE BASINS ON LONG ISLAND, NEW YORK, IN 1969, Geological Survey, Washington, D.C. D. A. Aronson, and G. E. Seaburn. Available from Sup Doc, GPO, Washington, D.C. 20402, Price \$1.45 (paper cover). Geological Survey Water-Supply Paper 2001-D. 1974. 22 p, 8 fig, 1 plate, 2 tab, 31 ref.

Descriptors: *Artificial recharge, *Storm runoff, *Urban hydrology, *New York, Hydrogeology, Glacial drift, Urban runoff, Infiltration, Clogging, Groundwater movement, Water management(Applied).
Identifiers: *Long Island(NY).

Recharge basins on Long Island are unlined pits of various shapes and sizes excavated in surficial deposits of mainly glacial origin. Of the 2,124 recharge basins on Long Island in 1969, approximately 9% (194) contain water 5 or more days after a 1-inch rainfall. Basins on Long Island contain water because (1) they intersect the regional water table or a perched water table, (2) they are excavated in material of low hydraulic conductivity, (3) layers of sediment and debris of low hydraulic conductivity accumulate on the basin floor, or (4) a combination of these factors. A larger percentage of the basins excavated in the Harbor Hill and the Ronkonkoma morainal deposits contain water than basins excavated in the outwash deposits. A larger percentage of the basins that drain industrial and commercial areas contain water than basins that drain highways and residential areas. Storm runoff from commercial and industrial areas and highways generally contains high concentrations of asphalt, grease, oil, tar, and rubber particles, whereas runoff from residential areas mainly contains leaves, grass cuttings, and other plant material. Differences in composition of the soils within the drainage areas of the basins on Long Island apparently are not major factors in causing water retention. Evaporation does not significantly con-centrate the chemical constituents and, therefore, evaporation is not a major mechanism of water disposal from these basins. (Knapp-USGS) W74-12655

4C. Effects On Water Of Man'S Non-Water Activities

ENVIRONMENTAL IMPACT ANALYSIS: THE EXAMPLE OF THE PROPOSED ALASKA PIPELINE, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 6G. W74-12011

INTERNATIONAL WORKSHOP ON THE HYDROLOGICAL EFFECTS OF URBANIZA-TION, WARSAW, 1973.

American Society of Civil Engineers, New York. ASCE Report to National Science Foundation on International Workshop, January 1974. 61 p. NSF Grant GK-35974

Descriptors: *Urbanization, *Urban hydrology, *Conferences, *International Hydrological Decade, Research and development, Rainfall-runoff relationships, Climatology, Water quality, Water pollution, Ecology, Environmental effects.

An International Workshop was held by IHD-UNESCO on the Hydrological Effects of Urbanization. The developed countries have already experienced the effects of urbanization on the hydrological cycle, and urbanization of areas is increasing with the likelihood that further damage will be done. There is also evidence that urbanization will increase in the developing countries and that problems will arise there similar to those that have been encountered elsewhere. The effects of

Identification Of Pollutants-Group 5A

water pollution from large-scale mining operations are comparable to those from industries. Urban areas affect, and are affected by, distant human activities. Among the obvious effects are increased population densities and increased concentrations of residential, industrial and commercial buildings and facilities, with resultant increases in areas that are impervious. Hydrological impacts then include the effects of these changes on the natural drainage, runoff, groundwater, sediment, water quality, water demands, and on measures utilized for the disposal of wastes and surplus water and for the supply of water. Among the hydrological problems associated with urbanization are the continually increasing demands for water for various uses, changes in the physical environment that alter the natural water balance, and the disposal of wastes that may contaminate streams and groundwater. The most important topics for research are changes in surface runoff caused by urbanization; quantity and quality of runoff; soil moisture and groundwater; water demand forecasting; water quality effects related to groundwater; and effects of waste water and sludge on the natural purification capacity of receiving waters and on aquatic life. (Knapp-HSGS) W74-12052

WATER QUALITY AND RELATED STUDIES, JACKSONVILLE AREA, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5B.

ENVIRONMENTAL GUIDELINES DEVELOPMENT ROADS IN THE SUBARCTIC, Environmental Protection Agency, College, Alaska. Arctic Environmental Research Lab. For primary bibliographic entry see Field 5G. W74-12223

APPLICATION HYDROLOGIC AND HYDRAU-LIC RESEARCH TO CULVERT SELECTION IN MONTANA, VOLUME 1, REPORT, Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics. For primary bibliographic entry see Field 8A. W74-12340

WATER RESOURCES PROTECTION MEA-SURES IN LAND DEVELOPMENT - A HAND-Delaware Univ., Newark. Water Resources Center. For primary bibliographic entry see Field 5G. W74-12352

IMPACT OF FOREST MANAGEMENT PRAC-TICES ON THE AQUATIC ENVIRONMENT Quinault Indian Reservation, Taholah, W Quinault Resource Development Program. For primary bibliographic entry see Field 5C. W74-12355

EFFECTS OF CLEAR CUTTING ON WATER DISCHARGE AND NUTRIENT LOSS, BITTER-ROOT NATIONAL FOREST, MONTANA, MONTANA, MONTANA Univ., Missoula. Dept. of Geology. For primary bibliographic entry see Field 5B. W74-12359

BEECH CREEK, MT. VERNON, OREGON, FLOOD CONTROL CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 4A. W74-12599

OSWEGO STEAM STATION, UNIT 6, NIAGARA MOHAWK POWER CORPORA-TION, OSWEGO HARBOR, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATE-

Army Engineer District, Buffalo, N.Y.
For primary bibliographic entry see Field 6G. W74-12600

HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1972, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 7C.

AN ENVIRONMENTAL REFERENCE FOR THE AN ENVIRONMENTAL REFERENCE FOR THE CONSTRUCTION INDUSTRY, Indiana Univ., Bloomington. Poplars Research and Conference Center. For primary bibliographic entry see Field 5C. W74-12661

4D. Watershed Protection

W74-12653

WATERSHED VALUES IMPORTANT IN PLANNING, Forest Service (USDA), Franklin, N.C. Southeast-

ern Forest Experiment Station.

I. E. Douglass. In: Optimizing the South's Forest Resources, Proceedings of the Second Regional Technical Conference, March 11-15, 1974, Houston, Texas, Astroworld Hotel, Texas Forest Service, College Station, p 59-73. 3 fig, 1 tab, 37 ref.

Descriptors: *Land use, Planning, *Water resources development. Water resources, *Water quality, Streams, Runoff, *Stream regimen, Water pollution sources, Water pollution treatment, Watershed protection, *Southeastern U.S.

Forests cover 20 to 65 percent of the land in the major water resource regions of the South, and forest management practices control or regulate the volume and timing of streamflow from these lands. Although water quality is emerging as the major water problem, quality and timing of streamflow will be important and interrelated watershed values which should be considered in land use planning. Protection or improvement of hydrologic performance of forest soils will con-tinue to be an important consideration in planning. W74-12230

ESTIMATION OF RAINFALL EROSION INDEX, Engineering-Science, Inc., Berkeley, Calif For primary bibliographic entry see Field 2J. W74-12321

BAKER LAKE WATERSHED PROJECT, FAL-LON COUNTY, MONTANA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Soil Conservation Service, Bozeman, Mont. For primary bibliographic entry see Field 4A. W74-12601

WATERSHED PROJECTS.

Hearings—Subcomm on Conservation and Credit, Comm on Agriculture, U.S. House of Representa-tives, 93rd Cong, 1st Sess, May 8, 21, and October 30, 1973. 98 p.

Descriptors: *Watershed management, *Federal government, *Flood protection, *Channeling, Water management(Applied), water management(Applied),
Watersheds(Basins), Flood control, Water control, Channel improvement, Dams, Erosion control, Flood plains, Multiple-purpose projects,
Reservoirs, Flood plain zoning, Watershed Protection and Flood Prevention Act, Rivers, Streams, Organizations, Administrative agencies, Govern-mental interrelations, Soil management. Identifiers: *Congressional hearings.

Hearings were conducted to obtain general testimony regarding nine watershed projects proposed by the Soil Conservation Service (SCS). The projects primarily enhanced watershed pro-The projects primarily enhanced watershed protection and flood prevention. The projects considered were: Bacon Creek, Iowa; Carbon Hill Watershed, Montana; Cow Creek, Oklahoma; Lost Creek, Missouri; Nutwood Watershed, Ilinois, Oolenoy River, South Carolina; Prichett Creek, West Virginia; Tallulah Creek, North Carolina; Truth or Consequences-Williamsburg Arroyos, New Mexico. The SCS made detailed presentations, including environmental impact statements, on each of the projects. Statements by interested Congressmen and other officials were also submitted. Representatives of the Environmental Policy Center and Environmental Action voiced opposition to those projects which invoiced opposition to those projects which in-volved channelization. Environmental Action recommended that flood plain zoning be implerecommended that flood plant zoning be implemented in all watersheds prior to construction and that the SCS be given authority to veto zoning variances granted even after project completion. While the environmental impact statements prepared by the Department included the adverse ecological effects which would result from certain projects, the statements by the two environmental groups were the only testimony in opposition to any of the projects. (Deckert-Florida) W74-12622

SOWASHEE CREEK WATERSHED, LAU-DERDALE COUNTY, MISSISSIPPI (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 4A. W74-12626

SAND GULLYING IN A SAHELIAN SITE: OB-SERVATIONS DURING RECENT RAINFALL IN THE NOUAKCHOTT REGION (MAURITANIA), Institut Fondamental d'Afrique Noire, Dakar (Senegal). Dept. of Geography. (Senegar), Dept. of Geography.
C. Barbey, and J. Carbonnel.
C. R. Hebd Seances Acad Sci Ser D Sci Nat. Vol.
274, No. 22, p. 2933-2935. 1972. Illus.
Identifiers: *Erosion, *Gullies, Mauritania,
Nouakchott, *Rainfall intensity.

Rainfall intensity was indicated by splashes on Euphorbia up to 25 cm from the soil, and soil moisture at a depth of 10 cm. The shrub vegetation is the principal factor causing streaming. The presence of nebkas, and their density (on the average 1/5 m) promote the concentration of the extension in the resulting natural channels. This streaming in the resulting natural channels. This flow canalization partly accounts for the torrential aspect of the ravine forms. The plant cover also in-fluences the types of erosion through the roots. Euphorbia roots act as preferential penetration axes for the percolation water. The fine and dif-fuse roots of Panicum form resistance islets against streaming. The drooping stems provide extra protection.--Copyright 1973, Biological Abstracts, Inc.

5. WATER QUALITY MANAGEMENT AND **PROTECTION**

5A. Identification Of Pollutants

ECOLOGY AND ANALYSIS OF TRACE CON-TAMINANTS - PROGRESS REPORT, JANUARY 1973-SEPTEMBER 1973. Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-12021

Group 5A-Identification Of Pollutants

ENVIRONMENTAL MONITORING OF TOXIC MATERIALS IN ECOSYSTEMS,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-12023

TOXIC METALS IN SEDIMENTS.

3 fig. 5 tab. 11 ref.

Oak Ridge National Lab., Tenn. E. A. Bondietti, R. R. Perhac, F. H. Sweeton, and T Tamura. ORNL-NSF-EATC-6, p 176-194, January 1974.

Descriptors: *Toxicity, *Toxins, Ecology, *Sediments, Analysis, *Assay, Chemicals, Soil analysis, Cadmium, Nickel, Marshes, Wetlands, *New York, Pollutant identification. Identifiers: *Foundry Cove(NY).

Two distinctly different sediment samples taken from a cadmium- and nickel-contaminated marsh in Foundry Cove, New York, were characterized with respect to chemical forms of cadmium and nickel present. Sediment particle separations using density gradient centrifugation revealed the presence of mixed cadmium-calcium carbonates in the most contaminated sediment (3.9% Cd). The second sediment sample, which had less total cadmium (0.19%) and no CdCO3, contained three times as much exchangeable Cd(2+) as the higher cadmium sediment and maintained approximately the same Cd(2+) concentration in solution. Thus, the availability of cadmium from the two samples may not be in proportion to their total cadmium contents. The results of the characterization study emphasize the necessity for studying chemical forms rather than just total amounts. More than one site is suggested for studies of this type. (See also W74-12021) (Houser-ORNL) W74-12025

DEVELOPMENT OF HIGH SENSITIVITY X-RAY FLUORESCENCE FOR ANALYSES OF TRACE TOXIC ELEMENTS.

Oak Ridge National Lab., Tenn. C. J. Sparks, Jr., J. C. Ogle, H. W. Dunn, and L. D.

In: ORNL-NSF-EATC-6, p 243-269, January 1974. 7 fig. 3 tab, 8 ref.

Descriptors: *Analytical techniques, *X-ray fluorescence, *Fluorescence, Research and development, Ecology, Environment, *Trace elements, Instrumentation, Design criteria, Spec-

Identifiers: High sensitivity, *Collimators.

Methods for using x-ray fluorescence for quantitative determination of trace elements in samples of environmental interest are given. Monoenergetic exciting x-rays obtained by using a doubly bent hot-pressed pyrolytic graphite monochromator with a standard x-ray tube and solid-state detector system allow the determination of trace elements to levels of a few parts per million. Geometrical considerations in the design of the x-ray detection collimator system are discussed, and the measure-ments of the necessary parameters for converting observed fluorescent intensities into quantitative units are described. (See also W74-12021) (Houser-ORNL) W74-12028

ENVIRONMENTAL APPLICATIONS OF CEN-

TRIFUGAL PHOTOMETRIC ANALYSIS, Oak Ridge National Lab., Tenn. G. Goldstein, J. L. Bowling, J. E. Strain, J. M. Dale, and T. R. Mueller.

In: ORNL-NSF-EATC-6, p 270-281, January 1974. 4 tab. 12 ref

Descriptors: *Analytical techniques, Environ-ment, *Pollutant identification, *Pollutants, Research and development, Analysis, Assay, Evaluation, Instrumentation, Measurement, Evaluation, Instrumentation, *Tennessee, *Spectrophotometry.

Identifiers: *Walker Branch Watershed(Tenn).

The purpose is to develop practical analytical methods for analysis of environmental pollutants using the GeMSAEC Fast Analyzer. During this report period a second GeMSAEC analyzer was acquired and instrument development for measurement of light emission signals was essentially completed. A signal amplifier was designed and fabricated, and a light-emitting diode (LED) was installed in place of the tungsten lamp on the second analyzer. A new modified FOCAL compiler was prepared for luminescence measurements and computer programming for implementing spectrophotometric, turbidimetric, and kinetic methods of analysis was completed. Specific methods that were developed are included. (See also W74-12021) (Houser-ORNL) W74-12029

SEPARATION, DETECTION, AND IDENTIFICATION OF ORGANICALLY BOUND TOXIC METALS AND OTHER HAZARDOUS MATERI-

Oak Ridge National Lab., Tenn.

Y. Talmi. In: ORNL-NSF-EATC-6, p 282-303, January 1974. 5 fig, 5 tab, 18 ref.

Descriptors: *Analytical techniques, Research and development, *Metals, *Toxins, Toxicity, Trace elements, Chemistry, Instrumentation, Laboratories, Mercury, Air pollution, Water pollution, Arsenic, Selenium, Chromatography, *Gas chromatography, Microwaves, *Pollutant identification, Spectrophotometry.

A gas chromatograph-microwave emission spec-trometric detector (GC-MES) system has been built and applied to a variety of analytical and physical problems. The sensitivity of the MES detector is affected insignificantly by the molecular structure of the sought compound. Thus the detection limit for (CH3)2Hg, CH3HgCl and C2H5HgCl is 6, 7 and 4 pg, respectively. This system was successfully applied to the analysis of CH3HgCl at various concentration levels in fish tissue. procedure is significantly simpler than any other, and the relative sensitivity is at the 5 ppb level. and the relative sensitivity is at the 5 ppb level. The high accuracy, precision, and flexibility provided by this technique are demonstrated in a physical chemistry study made to determine the following subjects: (1) kinetics of the reaction of halogens with CH3HgX, (2) solubility of CH3HgCl in H2O, (3) vapor pressure of CH3HgCl and (4) determination of air/water distribution coefficient for (CH3)2Hg. (See also W74-12021) (Houser-W74-12030

MEASUREMENT OF MOLECULAR ORGANIC CONTAMINANTS IN POLLUTED WATER BY LIQUID CHROMATOGRAPHY,

Oak Ridge National Lab., Tenn. W. W. Pitt, R. L. Jolley, S. Katz, and G. Jones. In: ORNL-NSF-EATC-6, p 304-316, January 1974. 3 fig. 2 tab. 11 ref.

Descriptors: Wastes, *Measurement, *Organic compounds, *Water pollution, Research and development, Assay, Absorption, Oxidation, *Chromatography, Evaporation, Ion exchange, Cation exchange, Toxicity, Public health, *Pollutant identification, *Organic wastes.

Trace organic compounds present in natural waters are being separated and identified with the aid of high-resolution liquid chromatography (HRLC). The chromatographic system currently being used is capable of separating and detecting as many as 150 ultra-violet-adsorbing compounds and/or compounds oxidizable with sulfatoceric acid in a single sample. Concentration factors as large as 10(4th) have been obtained with less than 10% loss of dissolved organic carbon using twostage, low-temperature evaporation preceded by cation exchange to remove inorganic salts. Samples from six chosen sites have been collected, concentrated, and chromatographed. These sites were chosen so as to be representative of various types of natural waters; unpolluted and polluted; small streams, rivers, and lakes, etc. In addition to these, a sample of the sodium humate fraction of a soil extract was chromatographed. (See also W74-12021) (Houser-ORNL) W74-12031

RAPID 15-N ISOTOPIC-RATIO ANALYTICAL SYSTEM FOR ENVIRONMENTAL SAMPLES, Oak Ridge National Lab., Tenn.

J. A. Carter, D. R. Matthews, R. L. Walker, and J. R Walton

In: ORNL-NSF-EATC-6, p 317-329, January 1974. 4 fig. 5 tab, 11 ref.

Descriptors: *Nitrogen, Measurement, Environ-ment, Sampling, Assay, *Analytical techniques, *Spectrometers, Gases, Chemistry, Chemical reactions, *Radioisotopes, *Pollutant identification.

An analytical system for measuring total nitrogen and its isotopic abundance in a variety of environ-mental samples has been developed. A reductive pyrolysis system and a directional focusing 6-in. gas mass spectrometer were combined into the analytical system. In the reductive part of the system, nitrogen species are converted to ammonia with an atmosphere of hydrogen in the presence of a heated nickel catalyst. Five percent of the gas stream is split for measuring total nitrogen by a conductivity detector. The ammonia is removed from the gas stream by employing a cold-finger reaction vessel. The hydrogen-free ammonia is decomposed thermally to nitrogen and hydrogen at 1000 C, by using a hot rhenium filament. The N-2 produced from the decomposition is used for measuring the abundance of masses 28 and 29 by mass spectrometry. From this ratio, the N-15 atom fraction is calculated. (See also W74-12021) (Houser-ORNL) W74-12032

TOXIC MATERIALS INFORMATION CENTER. Oak Ridge National Lab., Tenn. Environmental Information Systems Office.
For primary bibliographic entry see Field 10D. W74-12035

THE FLOW OF MERCURY IN SOCIETY, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B.

W74-12036 RADIOACTIVE EFFLUENTS FROM NUCLEAR

POWER STATIONS IN THE COMMUNITY; DISCHARGE DATA - RADIOLOGICAL ASPECTS European Communities, Luxembourg. Commis-

For primary bibliographic entry see Field 5B. W74-12037

MIGRATION OF RADIOACTIVE STRONTIUM IN THE BIOSPHERE - SOME DATA ON RADIOSTRONTIUM AS A FACTOR IN ENVIRONMENTAL CONTAMINATION, For primary bibliographic entry see Field 5B. W74-12039

SOME DATA ON MOVEMENT OF RADIOSTRONTIUM WITH GROUNDWATER CUR-

For primary bibliographic entry see Field 5B. W74-12040

Identification Of Pollutants-Group 5A

ENVIRONMENTAL SURVEILLANCE AT HAN-

FORD FOR CY-1973,
Battelle-Pacific Northwest Lab., Richland, Wash.
Occupational and Environmental Safety Dept.
For primary bibliographic entry see Field 5B.
W74-12044

ENVIRONMENTAL MONITORING REPORT FOR SANDIA LABORATORIES FOR 1973,

Sandia Lab., Albuquerque, N. Mex. For primary bibliographic entry see Field 5B. W74-12047

LEAK DETECTION IN UNDERWATER OIL

PIPELINES, National Maritime Research Center, Galveston, Tex. Cargo Handling and Terminals Program. P. A. Jackson.

Available from NTIS, Springfield, Va 22161 as COM-73-11776 Price \$3.00 printed copy; \$2.25 microfiche. NOAA Report 272-23100-R2, September 1973: 32 p, 14 fig, 1 tab.

Descriptors: *Oil spills, *Monitoring, *Water pollution control, *Leakage, *Instrumentation, Acoustics, Telemetry.
Identifiers: *Leak detection.

Leak detection devices suitable for underwater oil pipelines are discussed. The review includes consideration of leak or crack detection by flow measurement, pressure, ultrasonics, acoustic emission, magnetic flux, visual examination, eddy current, radioactive slugs, electromechanical and electrochemical tapes, doublewalled pipes, coaxial cable, lasers, permeable membranes, and remote sensing. The review was performed to provide appropriate pollution control information prior to the construction of underwater oil pipelines from deep water tanker terminals to shore facilities. It is recommended that a stationary ultrasonic throughthe-pipe-wall crack/flow detector be used with a coaxial cable and shroud positioned a short distance above the pipe. (Knapp-USGS)

BAILEY OIL CONTENT MONITOR,

Esso Research and Engineering Co., Floram Park, N.J. J. O. Moreau, and J. J. Heigl.

Available from NTIS, Springfield, Va 22161 as COM-73-10940, Price \$3.00 printed copy; \$2.25 microfiche. Final Contract Report to Maritime Administration, April 1973. 88 p, 14 fig, 3 append. Contract No C-1-35049.

Descriptors: *Oil pollution, *Water pollution control, *Monitoring, *Ships, Oil water, Instrumentation, Fluorescence, Fluorometry.

A device to monitor oil in the overboard discharge of ballast water was evaluated. The unit and ancillary equipment items meet shipboard requirements for mechanical rigidity and intrinsic safety. The Bailey Monitor was tested aboard the Esso Scotia. The system is sufficiently sensitive to detect low concentrations of crude oil in water. As a quantitative measuring device, a number of factors affected the accuracy of the system. These included improper calibration and signal saturation effects which can introduce small to major errors in the which can introduce small to happy errors in the readings. These errors can be greatly reduced. (Knapp-USGS) W74-12066

SOLMNEQ: SOLUTION-MINERAL EQULIBRI-

UM COMPUTATIONS, California Univ., Berkeley. Dept. of Geology and Geophysics.

For primary bibliographic entry see Field 2K.

W74-12086

ASPECTS OF MONITORING AND CONTROL

ASPECTS OF MONITORING AND CONTROL OF WATER QUALITY, Great Ouse River Authority (England). R. H. Billington, N. Taylor, and D. C. Young. In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Con-ference, University of Reading, England, p 181-208, 25-27 September 1973. 9 fig, 4 tab, 15 equ.

Descriptors: *Water quality control, Computers, *River basins, *Systems analysis, *Data processing, Management, Monitoring, Sampling, Pollutants, Statistics, Simulation analysis, Projects, Mathematical models.

Identifiers: *Great Ouse River basin(England).

Outlined are some simple techniques used in electronic data processing that have been developed for use in the day-day management of water qu ty within the Great Ouse River Authority area. The routine surveillance scheme in operation there is described. Examples of computer usage are discussed. Considered are a sampling frequency, a pilot study, the processing of water quality, data presentation, management information service, and monitoring. Next, there is a discussion of the more advanced computer-based techniques being developed and used for a systems analysis study of water quality in the Bedford Ouse River basin. Considered are short- and long-term management and operational control of river water quality and the characteristics of existing analytical models, such as the Streeter-Phelps model and Monte Carlo simulation. The limitations of the computer in water resource system planning and manage-ment are mentioned briefly. (See also W74-12107) (Bell-Cornell) W74-12117

COMPUTER ASSISTED QUANTITATIVE SPECTROGRAPHIC ANALYSIS, Water Research Association, Marlow (England).

R. Crabbe.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 60-62, 25-27 September 1973.

Descriptors: *Water chemistry, Computers, *Water sampling, *Trace elements, Digital computers, Equations, *Water quality control, *Pollutant

identification.
Identifiers: *Spectrographic analysis, Quantitative

Valuable savings have been achieved in time and expense at the Water Research Association by using a computer to perform calculations necessausing a computer to perform calculations necessa-ry in the quantitative assessment of trace elements in water samples. This short paper details the method of spectrographic analysis; computing considerations are accounted for. Use of a digital computer is the best and most convenient means of improving speed of calculation. (See also W74-12107) (Bell-Cornell) W74-12137

29 JUNE 1972).

American Society for Testing and Materials,

Descriptors: *Conferences, *Water quality. Water analysis, "Aquatic organisms, "Bioindicators, "Bioassay, techniques, "Pollutant identification, Monitoring, Discharge(Water), Water pollution control, Pollution abatement, Aquatic life, Pollution abatement, Aquatic life, Water pollution abatement, Aquatic life, water pollution abatement, Aquatic life, bischooling pollution abatement, Aquatic life, and the pollution abatement and th Biochemical oxygen demand, Toxicity, Mixing,

Mixolimnion, Effluents, Indicators, Path of pollu-tants, Quality control, Water manage-ment(Applied), Sampling, Laboratories.

The proceedings of an ASTM symposium on the biological assessment of water quality, held June 26-29, 1972 in Los Angeles, Calif., comprise 17 technical contributions by different authors. They deal with the following topics: Interaction of en-gineers and biologists in water quality management; pollutant bioassay and sampling techniques; internal and external rapid monitoring systems for effluent discharges and polluted receiving streams; mixing zone concepts; BOD tests; the use of fish, algae, diatoms, bacteria, aquatic inver-tebrates, and other aquatic organisms as pollution indicators; histological and histochemical diagnoses and prognoses of pollutant effects; toxicity tests; and mobile bioassay laboratories. (See W74-12175 thru W74-12191) (Brown-IPC) W74-12174

INTERACTION OF ENGINEERS AND BIOLO-

GISTS IN WATER QUALITY MANAGEMENT, Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering. For primary bibliographic entry see Field 5G. W74-12175

THE ABC'S OF POLLUTANT BIOASSAY

USING FISH, Guelph Univ., (Ontario). Dept. of Zoology.

J. B. Sprague. In: Biological Methods for the Assessment of

Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 6-30. 6 fig, 47

Descriptors: *Bioassay, *Toxicity, *Water pollution effects, *Analytical techniques, *Testing procedures, Fish, Aquatic organisms, Fishkill, Statistical methods, Mixing, Trout, Rain trout, Lethal limit, *Pollutant identification. Identifiers: Sublethal effects, Chronic effects. Trout. Rainbow

A recommended method for testing the acute toxicity of pollutants to fish is described. Among improved procedures advocated are mainly more frequent observations of mortality and use of simple statistical treatment. The four-day lethal concentration or the lethal threshold concentration should be used as final expression of test results. Toxicity curves should be constructed as the experiment progresses, for the information of the investigator. Tests, whether static or continuous-flow, should provide at least 2, preferably 3 liters of test water per gram of fish per day, and should not be aerated. Standard species, such as rainbow trout, are recommended. Effects of mixtures should be assessed by adding toxicant concentrations which have been expressed as fractions of the lethal concentration. Some suggestions are also made for using the standard bioassay technique in studies of sublethal and chronic ef-fects. (See also W74-12174) (Brown-IPC) W74-12176

MIXING ZONE CONCEPTS,

National Academy of Sciences, Washington, D.C. Environmental Studies Board. For primary bibliographic entry see Field 5G. W74-12177

BIOLOGICAL MONITORING OF THE AQUATIC ENVIRONMENT,

Environmental Protection Agency, Cincinnati, Ohio. Analytical Quality Control Lab.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 46-60. 5 fig, 2 tab. 51 ref.

Group 5A-Identification Of Pollutants

Descriptors: *Water quality control, Waste water(Pollution), *Pollutant identification, *Water water Foliution, Floatistant technication, water pollution, Bioassay, Water analysis, Analytical techniques, Aquatic life, *Monitoring, Federal government, *Data collections, *Sampling, Standards, *Water quality standards, Computer programs, Laboratory tests, Ohio, United States, Aquatic microorganisms, Aquatic organisms, Coordination, Federal project policy. Identifiers: STORET(Computer program)

A nation-wide water quality monitoring network operated from 1957 to 1968 in Cincinnati by a cen-tral Federal laboratory was decentralized in 1968, responsibility for its operation being transferred to regional offices of the Federal Water Quality Administration. An Office of Monitoring was established after creation of the Environmental Protection Agency to provide overall technical coordination of the monitoring program and to standardize methodology and maintain quality control of the data. Four types of monitoring have been identified: ambient trend, source, case preparation, and research monitoring. The monitoring network of the EPA will comprise 5000 to 10,000 EPA-funded stations plus 40,000 to 50,000 stations operated by state and local agencies. Data are to be stored in a central EPA computerized system called STORET. The Analytical Quality Control Laboratory (AQCL) in Cincinnati is charged with responsibility for quality control and for development, validation, and standardization of chemical, microbiological, and biological methods for water and waste water analyses. Biological methodology employed in the EPA's monitoring task deals mainly with sample collection and processing, counting and identification of aquatic organisms, biomass estimation, measurements of bioaccumulation and biomagnification of pollutants, and processing and interpretation of biological data. The QCL conducts research in all areas of biological methods for water quality monitoring, develops reference samples for quality control, and conducts agency-wide interlabora-tory methods studies. A biological methods manual was to be prepared and made available in 1973. (See also W74-12174) (Brown-IPC) W74-12178

BACTERIA AND THE ASSESSMENT OF WATER QUALITY,

Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 61-75. 74 ref.

Descriptors: Aquatic bacteria, Aquatic microorganisms, *Bacteria, *Water quality control,
*Monitoring, *Bioassay, *Metabolism,
*Bioindicators, Indicators, Coliforms, Microorganisms, Biomass, Measurement, Analytical ganisms, *Ba techniques, Testing procedures, Water quality, Sanitary engineering, Water treatment, Waste techniques, l'esting procedures, Water quality, Sanitary engineering, Water treatment, Waste disposal, Water pollution, Pollution abatement, Water pollution control, Water analysis, Water pollution effects, *Pollutant identification. Identifiers: Mineralization.

Bacteria are important to water quality evalua-tions, firstly because certain organisms may be used as pollution indicators, and secondly because bacteria have diverse metabolic capabilities causing the mineralization of substances which other organisms are unable to metabolize. Limitations of widely used coliform procedures are discussed. Some new approaches to the detection of fecal organisms are presented, along with methods for determining bacterial biomass. Measures of bacterial activity are more desirable than biomass estimates, because water quality is affected by the activity of microorganisms. Recent approaches to the direct assessment of bacterial growth and metabolism in natural habitats are outlined. (See also W74-12174) (Brown-IPC)

USE OF ALGAE, ESPECIALLY DIATOMS, IN

THE ASSESSMENT OF WATER QUALITY,
Academy of Natural Sciences, Philadelphia, Pa.
Dept. of Limnology. R. Patrick.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 76-95. 7 fig, 1

Descriptors: Algae, *Bioindicators, Aquatic organisms, *Aquatic algae, *Diatoms, Water quality control, *Monitoring, *Bioassay, Testing procedures, Analytical techniques, Water analysis, *Pollutant identification, Water pollution effects, Laboratory tests, Water quality, Metabolism, Plant physiology, Ecology, Artificial substrates strates

Identifiers: Environmental surveys

Two different approaches to the evaluation of algae as reliable water quality indicators are discussed. One approach involves observation and analysis of natural communities, in which the effect of a pollutant can be estimated by shifts in species composition and structure of the community. The other approach is to study a single species or a few selected species in laboratory cultures under carefully regulated conditions. Such studies are valuable in determining the physiological and morphological changes in function rates and polymorphism due to concentration of a given chemical or physical factor. (See also W74-12174) (Brown-IPC) W74-12180

USE OF AQUATIC INVERTEBRATES IN THE ASSESSMENT OF WATER QUALITY, Utah Univ., Salt Lake City. Dept. of Zoology.

A. R. Gaufin.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 96-116, 9 fig, 27 ref.

Descriptors: Water pollution effects, Water pollution control, *Monitoring, *Bioindicators, *Aquatic insects, *Invertebrates, *Bioassay, Testing procedures, Water quality control, Insects, Water pollution, Dissolved oxygen, Biology, Water beetles, Ecological distribution, *Pollution identification, Ecosystems, Aquatic life, Water quality

Identifiers: Macroinvertebrates, Septic zone

Since pollution affects primarily living organisms, biological studies of polluted waters have advantages over chemical water analyses: They are less time-consuming and provide a record of prevailing conditions unaffected by temporary effluent alleviations. Earlier studies in Lytle Creek (Ohio) revealed that little reliance can be placed on the mere occurrence of a single species in a given locality as a pollution indicator. The nine most numerous macroinvertebrate species in the septic zone also occurred in the recovery and clean water zones, though in smaller numbers. The septic zone contained less than 20% as many species as the clean zone, but many times the total number of organisms per unit area, namely, species adapted to live in low dissolved oxygen concentrations or capable of securing their oxygen directly from the air. The clean zone contained a variety of organ-isms intolerant of polluted conditions, mostly gillisms intolerant of polluted conditions, mostly gill-breathing immature stages of aquatic flies. As pol-lution indicators, different organisms must be con-sidered not separately but as biocommunities, i.e., as associated groups with different morphological adaptations and physiological requirements. Several formal systems for biological assessment of pollution from communal compositions have been suggested. A reduction in community diversity has been noted in several rivers polluted by or-ganic wastes. Diversity indices, based on information theory, are highly useful for comparing changes in the community composition of pollu-tion-affected streams. (See also W74-12174) (Brown-IPC)

W74-12181

TENTATIVE PROPOSAL FOR A RAPID IN-PLANT BIOLOGICAL MONITORING SYSTEM, Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.

J. Cairns, Jr., R. E. Sparks, and W. T. Waller.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 127-147, 10

Descriptors: *Bioindicators, *Industrial wastes, *Chemical wastes, *Bioassay, *Monitoring, Toxicity, Fish, *Zinc, *Copper, Copper compounds, Laboratory animals, Water pollution effects, Pollutants, Indicators, Lethal limit, Control systems, Ecosystems, Waste water(Pollution), *Pollutant identification.

Identifiers: Sublethal effects, Zinc compounds

Preliminary tests are reported for a rapid biological monitoring system which measures changes in the movement and breathing of fish as an early warning of developing toxicity in the waste discharges of an industrial factory. The system provides a continuous assessment of toxicity for comples mixtures varying with time. It was laboratory-tested with simulated spills of Cu and Zn. Fish can detect potentially lethal concentrations of Zn (8 mg/liter) rapidly enough to survive if the Zn is removed at the time of its detection, and also detect sublethal concentrations (2-3 mg/liter). (See also W74-12174) (Brown-IPC) W74-12183

RAPID BIOLOGICAL MONITORING SYSTEM FOR DETERMINING AQUATIC COMMUNITY STRUCTURE IN RECEIVING SYSTEMS,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.; and Virginia Polytechnic Inst. and State Univ., Blacksburg.

Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.

J. Cairns, Jr., K. L. Dickson, and G. Lanza.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 148-163, 5 fig.

Descriptors: *Water pollution, *Water pollution effects, *Monitoring, *Bioassay, Ecosystems, *Control systems, *Data processing, Aquatic life, Control systems, "Data processing, Aquate mer, Pollutant identification, Water manage-ment(Applied), Analytical techniques, Streams, Identifiers: Feedback, Sequential Comparison Index, Lasers, Holography, Saprobic system.

Biological monitoring of pollution provides information not available via conventional physical-chemical methods. The saprobic system and the use of structural and functional changes in aquatic communities are two approaches used in assessing the effects of pollutants on aquatic communities The feedback of information from conventional biological in-stream monitoring has been too slow for the most effective management of an aquatic system. Two rapid biological monitoring systems have been developed to increase the speed of data collection and analysis, viz., the Sequential Comparison Index, and an automated community structure analysis using laser holography. These systems are described as illustrated. (See also W74-12174) (Brown-IPC)

USE OF TOXICITY TESTS WITH FISH IN WATER POLLUTION CONTROL, Newtown Fish Toxicology Lab. National Water

Newtown Fish Toxicology Lab. National Water Quality Lab., Cincinnati, Ohio.
C. E. Stephan, and D. I. Mount.
In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 164-177, 14

Identification Of Pollutants—Group 5A

Descriptors: *Bioassay, *Toxicity, Fish, *Water pollution control, *Water pollution effects, *Testing procedures, Lethal limit, Fish populations, Fish behavior, Fish physiology, Pathology, Toxins, Pollutants, Fish conservation, Fish toxins, Taste, Aquatic animals, *Pollutant identification. Identifiers: Sublethal effects.

The three major functions of applied fish toxicology in water pollution control programs include: (1) to make the best possible decisions regarding the effects of pollution on fish, based on existing data; (2) to make available the additional data most needed for the protection of important fish spe-cies; and (3) to evaluate the usefulness of specific toxicity tests and ways of using them to fulfill identified needs and to suggest improved or new tests to be developed. The acute mortality test provides data that are useful in some situations. However, the chronic test (which studies the effects of a toxicant on survival, growth, and reproduction) is probably the most useful test for estimating long-term safe concentrations. Other important adverse effects that should be studied include avoidance, flavor impairment, and accumulation of toxic residues. (See also W74-12174) (Brown-IPC) W74-12185

ASSESSMENT OF FISH FLESH TAINTING

SUBSTANCES, Environmental Protection Agency, Grosse Ile, Mich. Grosse Ile Lab. N. A. Thomas

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 178-193, 2 fig, 2 tab. 26 ref.

Descriptors: Fish, *Taste, Fish diets, *Organoleptic properties, *Pollutant identification, *Water pollution effects, Effluents, *Industrial wastes, *Municipal wastes, Discharge(Water), *Ohio River, Ohio, United States, Nutrients, Foods, Testing procedures, Aquatic animals, *Channel catfish. Fishing, Rivers, Lakes, Identifiers: Sublethal effects.

Increased use of lakes and rivers for sport and commerical fishing in the vicinity of large mu-nicipal and industrial effluent discharges has led to the realization that fish in many bodies of water are not palatable. The discharge of organic com-pounds has contaminated fish flesh to the extent that fishing is curtailed more because of poor eat-ing quality than lack of fish populations. The mag-nitude of fish flesh tainting was studied, using channel catfish (Ictalurus punctatus Rafinesque) caught in the Ohio River from Pittsburgh, Pa., to Cairo, Ill. An organoleptic panell of fish tasters could differentiate between fish held upstream and downstream from a waste water discharge. Caged fish exposed for 3 days acquired a minimum of 70% of the off-flavor of native fish. (See also W74-12174) (Brown-IPC)

USE OF HISTOLOGIC AND HISTOCHEMICAL ASSESSMENTS IN THE PROGNOSIS OF THE EFFECTS OF AQUATIC POLLUTANTS,

EFFECTS OF AQUATIC PULLUTANTS, Louisville Univ., Kentucky. School of Medicine. D. E. Hinton, M. W. Kendall, and B. B. Silver. In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 194-208, 23 fig. 30 ref.

Descriptors: Water pollution effects, Water quality, *Toxicity, Fish toxins, *Mercury, *Enzymes, *Bioassay, *Bioinidicators, Animal pathology, Pathology, Biology, Catfishes, *Channel catfish, Fish, Aquatic animals, Heavy metals, Microscopy, Electron microscopy, Analytical techniques, Testing procedures, Monitoring, Pollutants, Fish physiology, *Pollutant identification.

Identifiers: Histology, Histochemistry, Tissues, Sample preparation, Prognosis, *Methyl mercury

The effects of water pollutants on fish tissues can be evaluated and predicted by histologic and histochemical techniques. These techniques are reviewed and discussed, including sample prepara-tion. Definitions of terms are included. The methodologies involved are illustrated by summarizing studies on the effect of methyl mercury chloride on channel catfish. Alterations in tissue structure and enzyme activity are evident as a result of exposure to low concentrations of heavy metal pollutants. Early alteration in response to aquatic toxins is detectable by electron microscopy in conjunction with enzyme histochemical analyses. The extent of alteration forms the basis for prognoses and thus for the development of reasonable water quality standards. (See also W74-12174) (Brown-IPC)

STABILIZATION OXYGEN DEMAND.

Weston and Stack, Inc., Malvern, Pa.

V. T. Stack, Jr.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 209-220, 7 fig,

Descriptors: *Biochemical oxygen demand, *Oxygen demand, *Bioassay, *Biodegradation, *Oxygen demand, *Bioassay, *Biodegradation, *Organic compounds, Water pollution, *Analytical techniques, *Testing procedures, Or-ganic loading, *Pollutant identification, Microorganisms, Aquatic microorganisms, Standards, Chemical reactions.

Identifiers: Stabilization oxygen Biosynthesis.

The oxygen required for biological stabilization of organic matter is a fundamental parameter in assaying the presence of such biodegradable materials. Comparative results present the status of biological stabilization reactions in natural systems and biological processes. The 5-day BOD test has been used as a limited measurement of the desired data. A stabilization oxygen demand (SOD) technique for more definitive examination of bio-stabilization is being developed by a task force of ASTM Committee D-19 on Water. The analytical technique is based on measurements of energy oxygen utilized in support of synthesis reactions and of the resulting synthesis of microor-ganisms. Completion of analysis in ca. 1 hr is an objective. The SOD is calculated as the sum of energy oxygen and autoxidation oxygen utilized in the stabilization of synthesized cell material. The synthesis may conceivably be measured by deter-mining changes in ATP (adenosine triphosphate) concentrations. (See also W74-12174) (Brown-W74-12188

MICROBIOLOGICAL INHIBITION TESTING

PROCEDURE, Weston (Roy F.), Inc., West Chester, Pa. P. J. Marks.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 221-226, 2 fig, 1 tab, 2 ref.

Descriptors: *Inhibition, *Microorganisms, Activated sludge, Water pollution effects, *Testing procedures, Analytical techniques, Pollutants, Waste Water(Pollution), *Bioassay, *Waste water treatment, *Biological treatment, Biochemical oxygen demand, Biodegradation, Effluents, Industrial wastes, Inhibitors, Oxidation, Monitoring, Biomass, Metabolism, *Pollutant identification. Identifiers: Microbiological Inhibition Testing Procedure.

A procedure for determining the potential adverse effects of specific compounds or waste waters on biological treatment processes is described. It involves the monitoring of the oxidation rate of a biological seed at various waste water dilutions in BOD bottles. The threshold inhibition level of a compound or specific effluent is defined as the lowest concentration which causes a reduction in the biological oxidation rate. (See also W74-12174) (Brown-IPC) W74-12189

USE OF ARTIFICIAL SUBSTRATE SAMPLERS

TO ASSESS WATER POLLUTION,
T. W. Beak, T. C. Griffing, and A. G. Appleby.
In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 227-241, 6 fig,

Descriptors: *Sampling, *Monitoring, Equipment, Benthic flora, Benthic fauna, Water pollution ef-fects, *Artificial substrates, *Bioassay, fects, "Artificial substrates, "Bioassay, Periphyton, Invertebrates, Aquatic organisms, Marine biology, Benthos, Marine animals, Marine plants, "Pollutant identification.

Benthic organisms (macro-invertebrates and micro- and macrophytic floral species) are important parts of aquatic ecosystems for measuring the impact of pollution. Artificial substrate samplers provide a means of sampling many locations where other samplers are ineffective. Their historic development and use, and the major types of available apparatus are discussed. Three macroinvertebrate samplers (the rock-filled basket, the multi-plate sampler, and the Beak steel tray) are evaluated critically and compared to results ob-tained using other methods (Surber sampler, dip net, and Petersen grab). Periphyton samplers usually consist of glass or plastic plates, with dif-fering methods of suspension. Marine intertidal and subtidal communities may be sampled by fiberglass plates bolted to rocks or building blocks. Artificial substrate samplers can obtain an equally diverse fauna with less variability between sam-They are an effective method of biological monitoring and evaluation of water pollution. (See also W74-12174) (Brown-IPC) W74-12190

MOBILE BIOASSAY LABORATORIES,

Industrial Bio-Test Labs., Inc., Northbrook, Ill. R M Gerhold

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 242-256, 1 tab. 34 ref.

Descriptors: Equipment, *Laboratories, Research facilities, *Bioassay, *Water quality control, *Monitoring, Research and development, Facilirocking, Research and development, Facilies, Measurement, Pollution abatement, Water pollution effects, Aquatic organisms, Sampling, Organizations, Institutions, Organoleptic properties, Toxicity, Pollutants, Water quality standards, Regulation, Water pollution control, Analytical techniques, Testing procedures, Boats, Barges, Tracking techniques Tracking techniques.

Identifiers: *Mobile laboratories, Directories, Trailers, Carts, Automotive equipment, Vehicles, Locomotive equipment.

Mobile laboratories with flow-through systems utilize actual receiving waters with their unique physical, chemical, and biological characteristics which are known to influence the toxicity of environmental contaminants. They offer definite advantages over stationary laboratories in collection vantages over stationary laboratories in collection of data for enforcement of water quality standards, for pest control studies, and for pollution engineering and research. They can also be used to investigate the tainting of edible aquatic organisms by organoleptic methods. A survey of mobile bioassay equipment and a list of organizations using them are provided. The table indicates the

Group 5A-Identification Of Pollutants

facilities (tractor trailer, house trailer, hospital cart, van, barge, houseboat, two-wheel trailer, self-propelled cab, etc.), the kind of studies performed, the organisms studied, and persons to be contacted for further information. Increasing use for such mobile bioassay laboratories is both recommended and predicted in applied research on pollution monitoring and abatement. Semi-per-manent streamside or floating laboratories can also help to gain fundamental knowledge on en-vironmental factors affecting the growth, development, reproduction, and behavior of aquatic organisms which is needed for better understanding of long-term pollution effects. (See also W74-12174) (Brown-IPC) W74-12191

DETERMINATION OF TRACE METAL POLLU-TANTS IN WATER RESOURCES AND STREAM

Dayton Univ., Ohio.

C. R. Cothern. C. R. Cotnern.
Available from the National Technical Informa-tion Service as PB-235 855 \$5.50 in paper copy, \$2.25 in microfiche. Ohio Water Resources Center, Columbus, Completion Report 424X, 1974. 182p, 2 append. OWRT B-044-OHIO(1).

Descriptors: *Analytical techniques, *Chemical analysis, Lake Sediments, Radioactive tracers, Organic compounds, "X-ray fluorence, "Trace elements, Surface waters, Plant physiology, "Pollutant identification, "Lake Erie, "Ohio, *Pollutant identification, *Lake Erie, *Ohio,
Absorption, *Electron microscopy, *Calibrations, Zinc, Strontium, Cadnium. Identifiers: Dayton(Ohio), *Great River(Ohio).

Studies were conducted concerning development of the technique of X-ray fluorescence (XRF) and electron spectroscopy for chemical analysis (ESCA) for trace metal analysis. Four independent (ESCA) for trace metal analysis. Four independent techniques for quantitatively calibrating an XRF spectrometer were compared showing the most reliable to be the semi-theoretical method. The minimum detectability limit for bremsstrahlung excitation was shown to be of the order of 10 ppm. A new method of peak spectra analysis was developed. It was shown that the K alpha/K beta ratio was constant for normal environmental samples. Also interelement effects were shown to be small for environmental samples. Electron excita-tion was shown to be a poor alternative to proton excitation. The technique of XRF was used to determine trace element concentration in Lake Erie sediments and water samples from the Great Miami River. This latter study revealed the im-portance of determining both the dissolved and suspended loads. A method was developed for energy calibrating an ESCA spectrometer for environmental samples. This method was applied to several zinc compounds and used to identify molecular species in sediments. It was shown that ESCA can be applied to both inorganic and organic environmental samples. An approach was developed to calculate the charge on an atom al-lowing systematic analysis of ESCA spectra. A radioactive isotope tracer technique was used to determine the uptake of Zn, Sr and Cd in buckwheat plants. This study showed synergistic effects between these elements. W74-12194

EFFECTS OF CADMIUM SALTS ON THE REPRODUCTIVE POTENTIAL OF MALE RAINBOW TROUT AS DETERMINED BY INVIVO AND INVITRO TECHNIQUES, Oklahoma State Univ., Stillwater. Dept. of Zoolo-

W. C. Sanford.

Available from National Technical Information Available from National Technical Information Service, Springfield, Va 22161 as PB-235 837 \$3.00 in paper copy; \$2.25 in microfiche. Oklahoma Water Resources Research Institute, Stillwater Completion Report, (1974). 16 p, 10 fig, 1 tab, 13 ref. OWRT A-042-OKLA(1), 14-31-0001-4036.

Descriptors: *Ultrasonics, *Cultures, *Rainbow trout, Cadmium, Chlorides, Gonads, *Fish reproduction, Growth rates, *Cytological studies, Pollutant identification, Water pollution effects.
Identifiers: *Trypsin, *EDTA, Liebovitz L-15,
Adhesive cells, *Cadmium salts.

A new method for dispersing strongly adhesive cells which uses trypsin and EDTA and ultrasonic sound at non-destructive levels, has been applied to cultures of rainbow trout gonad (RTG-2) cells and has yielded monodisperse cells. Cells dispersed with combined chemical and sonic treatment exhibited the same settling and adhesion times as those transferred without ultrasonic treatment. As measured by trypan blue dve exclusion, viability of cells after this isolation technique was 93%. This new method allows 100% recovery of cells from dense cultures, yields monodisperse cells in suspension, and reduces trypsin contact time. Cadmium chloride was added to Liebovitz L-15 medium to give concentrations of 0, 1, 5 and 10 mg CdCl2/1 to determine the effect of Cd on the growth rate and morphology of Rainbow Trout gonad cells. One mg CdCl2/1 had very little effect on the cells with growth rates and morphology equivalent to control cells lacking CdCl2. After 6 days contact with 5 mg CdCl2/1, a depression in growth rate below control levels was observed as well as a morphologic change in cells charac-terized by decreased substrate adhesion and the formation of thin granular cellular projections. At 10 mg CdCl2/1 a rapid loss of cells occurred with a loss of cellular integrity. W74-12204

PROCEEDINGS, SYMPOSIUM ON CONTROL OF FINE PARTICULATE EMISSIONS FROM INDUSTRIAL SOURCES.
Available from the National Technical Informa-

Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 829, \$13.00 in paper copy; \$2.25 in microfiche. Held January 15-18, 1974, San Francisco, California, Sponsored by US/USSR Working Group, Stationary Source Air Pollution Control Technology. Environmental Protection Agency, Report EPA-600/2-74-008, (1974), 775 p.

Descriptors: *Air pollution, *Control, Technology, *Particle size, Particle shape, *Measurement, Filters, *Industrial wastes, *Conferences, Instrumentation, Coagulation, Condensation, *Pollutant identification, Electrophoresis, Waste treatment. Identifiers: Fabric filters, *Fine particulates, Elec-trostatic precipitators, Wet scrubbers, Sonic ag-glomeration, Emissions, Air pollution sources.

Proceedings of the symposium contain papers from US and USSR on the application of conventional technologies for control of fine particles (3 microns and less), new concepts for fine particulate control, advances in measurement techniques, and chemical composition of fine particulates. The theory behind and the application of electrostatic precipitators, wet scrubbers, and fabric filters for removal of fine particulates from stationary sources are covered. New concepts covered in-clude sonic agglomeration, electrically induced agglomeration, coagulation and condensation with utilization of electrophoresis, thermophoresis, and diffissiophoresis. The presently applied particulate mass measurement methods, plume opacity measurement, instruments measuring efficiency of particulate control equipment, sampling from high-temperature, reactive, and corrosive gases, measurement of particle size distribution at emission sources are covered in papers on measure-ment techniques. (EPA) W74-12208

AN EVALUATION OF TAILINGS PONDS SEA-

LANTS, Robert S. Kerr Environmental Research Lab., Ada, Okla. For primary bibliographic entry see Field 5G. W74-12217

COMPARISON OF GERMANIUM DETECTORS FOR NEUTRON ACTIVATION ANALYSIS FOR

Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.

Southeast Environmental research Lab.

R. V. Moore, and O. W. Propheter.

Copy Available from GPO Sup Doc as EP1.23:660/2-74-045, \$0.55; microfiche from NTIS, Springfield, Va 22161 as PB-235 944 \$2.25. Series, Report EPA-660/2-74-045, June 1974. 12 p, 3 tab, 2 ref. EPA Project 16ADN 42, Program Element 1BA027

Descriptors: *Neutron activation *Mercury, Analytical techniques, identification, Chemical analysis. activation analysis, techniques, *Pollutant Identifiers: *Gamma ray detectors, *Germanium detectors, Low energy photon detectors.

Two types of lithium-drifted, solid-state, germani-um detectors were compared for their ability to detect and measure mercury in matrices of different complexity. Compared were (1) a large, coaxial detector with relatively high efficiency and a good peak-to-Compton ratio, and (2) a thin wafer detector, called alow energy photon detector (LEPD), which has a good resolution for low energy photons. In samples with relatively few elements primarily of low atomic number, the large detector is preferred because of its greater counting effi-ciency. In complex samples containing many elements that interfere with the mercury peak, e.g., samarium, thorium, barium, and tungsten, the de-tector of choice is the LEPD because of its ability to resolve the gamma photons. The choice of de-tector for intermediate samples would depend on the quantity of interfering elements present. (EPA) W74-12220

AN IMPROVED METHYLTHYMOL BLUE PROCEDURE FOR AUTOMATED SULFATE DETERMINATION,

Georgia Univ., Athens. Inst. of Ecology. For primary bibliographic entry see Field 2K. W74-12228

A PORTABLE APPARATUS FOR PRESSURE SIEVING BOTTOM SAMPLES, Southern Illinois Univ., Carbondale. Fisheries Research Lab. and Dept. of Zoology.

For primary bibliographic entry see Field 7B. W74-12258

MODULARIZED SYSTEMS FOR FIELD ANAL-

MODULARIZED SYSTEMS FOR FIELD ANALYSIS OF PRIMARY PRODUCTION IN CHESAPEAKE BAY,
Academy of Natural Sciences of Philadelphia,
Benedict, Md. Benedict Estuarine Lab.
R. S. Mullen, R. S. Shippen, and K. Mountford.
The Progressive Fish-Culturist, Vol 36, No 2, p 119-120, April 1974. 4 fig.

Descriptors: *Primary production, Technology, *Water sampling, On-site data collections, Sam-pling, Methodology, Dissolved oxygen, Instru-mentation, Chlorophyll, *Chesapeake Bay, Dis-solved oxygen analyzers, Pollutant identification, Identifiers: *Chlorophyll measurement, Water sampling apparatus, Chlorophyll extraction.

A modular system to measure primary production under field research conditions is described. Components are (1) water sampler holder, (2) dissolved oxygen analysis kit, (3) chlorophyll extraction kit and (4) sample bottle racks. (Katz) W74-12268

AN IMPROVED CHEMICAL DELIVERY AP-PARATUS FOR USE IN INTERMITTENT FLOW

BIOASSAYS,
Bureau of Sport Fisheries and Wildlife, Warm
Springs, Ga. Southeastern Fish Control Lab. For primary bibliographic entry see Field 7B. W74-12272

Identification Of Pollutants-Group 5A

THE EMISSION OF BIOGENIC HYDROGEN SULFIDE FROM AMAZONIAN FLOODPLAIN

Instituto Nacional de Pesquisas da Amazonia. Manaus (Brazil).
For primary bibliographic entry see Field 5B.
W74-12284

SORPTION OF ORTHOPHOSPHATE ON THE SURFACE OF WATER SAMPLE CONTAINERS, Agricultural Research Service, Morris, Minn. J. J. Latterell, D. R. Timmons, R. F. Holt, and E. M. Sherstad.

Water Resources Research, Vol 10, No 4, p 865-869, August 1974. 6 tab, 3 ref.

Descriptors: *Sorption, *Adsorption, *Phosphates, *Phosphorus, Chemical analysis, Phosphorus compounds, Inorganic compounds, Surfaces, Anion adsorption, Phosphorous radioisotopes, Analytical techniques, Spectrophotometry, *Pollutant identification.

Identifiers: *Orthophosphate, Ascorbic acid

Identifiers: *Orthopia-Borosilicate method, Borosilicate glass containers, Polyethylene containers, Coated galvanized metals, Uncoated galvanized metals, Desorption, Cubitainer, Plicote, Contact time, Radioactive

Orthophosphate sorption studies on borosilicate glass, polyethylene, and coated and uncoated galvanized metal were reported. The concentration range of orthophosphate in the solutions studied was 0.0075-1.00 ppm P, and the pH range was 5.8 8.8. The exposure of solution to surface ranged up to 14 days, ratios of surface area to milliliters of solution being in the range 0.04-1.14 sq cm/m.l.
The percent of the original orthophosphate sorbed
was determined by the use of radioactive 32P and by orthophosphate analysis using the ascorbic acid method. Studies indicated that aqueous solutions containing 0.03-0.112 ppm orthophosphate may be stored in either borosilicate or polyethylene bottles with less than 0.5% adsorption during the initial 24-hour storage period. The amount of sorption for a given sample was observed to increase as the contact time and/or the ratio of surface area to solution volume increased. Measurable quantities of orthophosphate were sorbed on galvanized sheet metal in all the studies made, indicating that sample-collecting equipment made of this material should be coated to minimize orthophosphate sorption. Various coatings were tested, and their effectiveness was minimizing sorption is reported. (Henley-ISWS) W74-12307

PERSISTENCE AND MOVEMENT OF DBCP IN THREE TYPES OF SOIL,

California Univ., Davis. Dept. of Nematology. For primary bibliographic entry see Field 5B. W74-12310

WATER QUALITY AND POLLUTION-SOUTH FORK OF LONG ISLAND, NEW YORK,
Wisconsin Univ., Oshkosh. Dept. of Geology
For primary bibliographic entry see Field 5B.

DATA ON SELECTED LAKES IN WASHING-TON, PART II.

Gological Survey, Tacoma, Wash. G.C. Bortleson, G. T. Higgins, and G. W. Hill. Available from Washington State Dept. of Ecology, Olympia, Price \$3.00 per copy. Washington State Department of Ecology, Olympia, Water-Supply Bulletin 42, June 1974, 145 p, 69 fig, 7 tab, 52 ref, append.

Descriptors: *Lakes, *Washington, *Limnology, Eutrophication, *Surveys, *Data collections, *Hydrologic data, Nutrients, Algae, Thermal stratification, Dissolved oxygen.

Twenty-three lakes in Washington were inrestigated to determine their present trophic status and evaluate their potential for nutrient enrichment from cultural and natural sources. The lake basins vary from relatively undisturbed forest homes numbering from none to more than 50 homes per mile of shoreline. The mean depth-probably the most significant morphometric parameter affecting lake productivity--was rather shallow (12-25 ft) in about two-thirds of the lakes investigated. The midsummer dissolved-oxygen profiles of most lakes show saturation or slight supersaturation in the epilimnion, and low oxygen content (often depleted) in the hypolimnion. The content (often depleted) in the hypolimnon. The observed specific-conductance values during winter mixing ranged from 10 to 145 micromhos per centimeter. The specific conductance for about 40% of the lakes was fairly low (10-50 micromhos per centimeter). The mean total phosphorus concentration in the photic zone throughout the year ranged from 3 to 108 microstation in the property of the propert grams per liter; the median value was 16 micro-grams per liter. The mean inorganic nitrogen (ammonia plus nitrate) concentration in the photic zone throughout the year ranged from 50 to 980 micrograms per liter; the median value was 180 micrograms per liter. Algal blooms were observed at least once on 9 lakes; persistent algal blooms were observed on 3 lakes. The bottom area occupied by submergent rooted aquatic plants ranged from 0.2% to 34% of the total bottom area, and the water surface occupied by emergent and (or) floating rotted aquatic plants ranged from less than 0.01% to 9.4% of the lake surface area. The lakes with the more abundant macrophyte growth con tained a higher percentage of muck in the littoral zone, while lakes with less abundant macrophyte growth contained a higher percentage of coarse sand, gravel and cobbles in the littoral zone. (See also W73-10654) (Knapp-USGS) W74-12341

EFFECTS OF RESIDUAL TOXINS IN OIL REFINERY EFFLUENTS ON AQUATIC OR-GANISMS,

Oklahoma State Univ., Stillwater. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.

W74-12348

FREEZE CONCENTRATION OF TOXIC POL-LUTANTS FOR BIOASSAY, Oregon State Univ., Corvallis. Water Resources Research Inst.

F. D. Schaumburg. Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 911, \$3.25 in paper copy, \$2.25 in microfiche. Comple-tion Report, July 1974. 24 p, 1 fig, 1 tab, 19 ref. OWRT A-018-ORE(1).

Descriptors: Chlorides, *Dieldrin, *Bioassay, Freezing, Toxicity, Toxins, Pulp wastes, Chemical analysis, *Pollutant identification, Water pollution effects

Identifiers: *Methylmercuric chloride, *Freeze concentration process.

A freeze concentration process was investigated as a possible method whereby sub-lethal concentrations of toxic substances in aqueous solution could be quantitatively concentrated for analysis by standard acute toxicity tests. Excellent chemical recoveries were obtained for a sodium chloride control sample; however, two toxic substances, methylmercuric chloride and dieldrin were not concentrated quantitatively. A dilute sample of kraft pulp mill effluent was also freeze-concen-trated and evaluated by chemical analysis. Bioassays using newborn guppies were undertaken on unconcentrated and freeze-concentrated solutions of dieldrin. These experiments revealed that the freezing process did not alter the toxic nature of the compound. In general, the results showed that the freeze concentration method is not a feasible

approach for concentrating dilute samples for acute toxicity analysis. W74-12349

ATOMIC ABSORPTION DETERMINATION OF NANOGRAM QUANTITIES OF ARSENIC IN BIOLOGICAL MEDIA, Washington Univ., Seattle. Dept. of Environmental Health.

R. M. Orheim, and H. H. Bovee. Analytical Chemistry, Vol 46, No 7, p 921-922, June, 1974. 4 fig, 1 tab, 13 ref.

*Spectroscopy. Descriptors: *Arsenic. Analytical techniques, *Organic matter, Labora tory tests, Testing procedures, Instrumentation, *Pollutant identification. Identifiers: *Atomic absorption spectroscopy.

An improved method is described for the preparation of organic samples and a sensitive procedure for arsenic analysis using a single-beam atomic absorption spectrophotometer. An arsine generator and collection train was assembled from standard laboratory glassware. The sample was digested with HCl, KI, SnCl2, and zinc and arsenic generated was trapped in tubing immersed in liquid nitrogen. Aqueous standards containing 0 to 500 ng nitrogen. Aqueous standards contaming 0 to 500 ng of arsenic were analyzed by the arsine generation procedure. The precision of nine replicate runs of 100 ng of arsenic was within 5%. Quantitative recovery of namogram amounts of added arsenic from whole blood has been demonstrated with accuracy varying from 95 to 105%. The single beam atomic absorption spectrometric procedure is essentially linear to 100 ng of arsenic with a useable curve to 500 ng. (Jernigan-Vanderbilt) W74-12479

ANALYSIS OF BACKGROUND COPPER CON-CENTRATION IN SEAWATER BY ELECTRON SPIN RESONANCE,

ansas State Highway Commission, Topeka.

Planning and Development Dept. Y. P. Virmani, and E. J. Zeller. Analytical Chemistry, Vol 46, No 2, p 324-325, February, 1974. 2 fig. 11 ref.

Descriptors: *Copper, *Sea water, *Analytical techniques, Testing procedures, Separat techniques, Solvents, *Pollutant identification. Identifiers: *Electron spin resonance. Separation

A technique was tested which makes possible the rapid analysis of the copper concentration in seawater in ranges as low as 0.1 ppb. The system makes use of Electron Spin Resonance (ESR) combined with concentration enhancement by chelation and solvent extraction. Copper can be observed as ESR in the aqueous phase. A concentration of 0.1% 8-hydroxyquinoline was tested in various organic solvents such as ethyl propionate, 3-propanone, ethyl acetate, butyl ether, methyl 3-propanone, entry acetate, butyl etner, metnyl isobutyl ketone, and cyclophexene. Ethyl propionate was the most satisfactory solvent for the seawater extractions. A plot of samples of seawater spiked with copper indicates a background value of 2.6 ppb Cu in the seawater. The total error of plus or minus 0.2 ppb arose from error in the spectrometer itself and error in the extraction system. (Jernigan-Vanderbilt) W74-12482

OCCUPATIONAL EXPOSURE TO INORGANIC

COMPOUNDS OF LEAD, Institute of Occupational Health, Zabrze (Poland). Dept. of Industrial Toxicology.

H. Urbanowicz.

Archives of Environmental Health, Vol 23, No 4, p 286-288, October, 1971. 1 fig, 3 tab, 12 ref.

Descriptors: *Inorganic compounds. Lead, Human physiology, Distribution, Analytical techniques, Average, *Industrial wastes, Correlation analysis, Adaptation, Lethal limit, *Air pollution effects.

Group 5A-Identification Of Pollutants

Identifiers: Sub-lethal effects.

A group, initially of 60 persons, was subjected to mild occupational exposure to lead during a period of two years' work in a new smelter. These men. under medical surveillance in an area in which the concentrations of lead in the air were determined at multiple sites on a bimonthly schedule, provided specimens of urine, also bimonthly, at the end of four hours of work on a morning shift. Urine was analyzed for content of lead, delta-aminolevulinic acid, and coproporphyrin. The data, are not sufficiently revealing to provide suitable criteria for the appraisal of the severity of the exposure in relation the danger of its continuance. (Rowe-Vanderbilt) W74-12483

DETERMINATION OF ZINC AND NICKEL BY CHARGED PARTICLE ACTIVATION ANALY-

Texas A and M Univ. College Station, Dept. of Chemistry.

October, 1973. 4 fig, 4 tab, 21 ref. NSF (GP-34877X).

Descriptors: *Zinc, *Nickel, *Analytical techniques, Chemical reactions, Heavy metals, Copper, Cobalt, *Testing procedures, Irradiation, Trace elements. Identifiers: *Activation analysis.

Procedures for the sub-ppm determination of zinc and nickel have been developed using charged particle activation analysis. Reactions with protons, deuterons, helium-3, and helium-4 beams on thick Zn and Ni targets have been investigated. The most favorable reactions for Zn and Ni analysis were the Zn-66(p,n)Ga-66 and the Ni-58(p,pn)Ni-57 reactions, respectively. A series of samples was analyzed with zinc or nickel contents ranging from 500 to less than 1 ppm, utilizing a post-irradiation chemical separation of the product nuclides. Results from thick target experiments indicate that both Zn and Ni determinations can be made at the ppb level. Activation curves (relative excitation functions) for the reactions used for analysis, as well as possible interfering reactions, are presented and discussed. (Jernigan-Vanderbilt) W74-12484

DETERMINATION OF MERCURY AND SELENIUM IN COAL BY NEUTRON ACTIVA-TION ANALYSIS, North Carolina State Univ., Raleigh. Dept. of

Nuclear Engineering.

J. N. Weaver. Analytical Chemistry, Vol 45, No 11, p 1950-1952, September, 1973. 4 fig, 1 tab, 6 ref.

Descriptors: *Mercury, *Selenium, *Coal, *Analytical techniques, *Neutron activation analysis, X-rays, Research and development, Trace elements, Heavy metals, Tracers, Testing procedures, Equipment.

The procedure described was an optimization of the technique of neutron activation analysis (NAA) and the utilization of a newly developed nuclear detector known as the Low Energy Photon Detector (LEPD). Although originally intended for charged particle analysis, research has shown (LEPD) to be quite promising as a partner with instrumental NAA based on X-ray identification of certain trace metals in irradiated materials. The identification of mercury was especially attractive because of the high cross section for production of the Hg-197 isotope, its 65-hr half-life and the strong intensity of several X-rays and a low energy gamma associated with its decay. Selenium (Se-75), with a 120-day half-life, was easy to identify using two low-energy gamma-rays. The method described for the determination of mercury and selenium in a variety of matrices including coal and fly ash achieves three significant improvements over currently used procedures. The procedure has no chemical manipulations, thereby eliminating technique-related errors. The procedure is based on the direct measurement of the X-rays from irradiated matrices, thus allowing the same technique to be used on a wide variety of matrices. (Jernigan-Vanderbilt) W74-12485

METALLIC POLLUTANTS MONITORED BY

ATOMIC ABSORPTION.
Water and Sewage Works, Vol 119, No 6, p 56-57, June, 1972. 1 tab.

Descriptors: *Heavy metals, Trace elements, Pol-Descriptors: "Heavy metals, Trace elements, Pol-lutants, "Analytical techniques, "Spectroscopy, Sewage treatment, Monitoring, Copper, Chromi-um, Calcium, Nickel, Zinc, Lead, Arsenic, Toxici-ty, Public health, "North Carolina, "Pollutant identification. Identifiers: "Atomic absorption spectroscopy,

Charlotte(NC).

The implementation of an atomic absorption monitoring operation in Charlotte, North Carolina to determine the concentrations of heavy metals in the water supply is discussed. Daily analyses of samples taken from three waste treatment plants were used to establish 'normal' levels of copper, chromium, calcium, nickel, zinc, and lead in the sewer system. The program included sampling industrial wastes from about 450 companies issued Permits to use the city sewage system. (Jernigan-Vanderbilt)

BERYLLIUM. Environment, Vol 16, No 3, p 35-36, April, 1974, 2

Descriptors: *Beryllium, *Toxicity, *Human pathology, Public health, Industrial plants, Metals, Standards, Research priorities, *Air pollution ef-fects, Pollutant identification. Identifiers: Occupational health.

Beryllium can have both acute and chronic effects. On the acute side it can produce skin ulcers, ocular On the acute side it can produce skin uicers, ocular ulcers, and respiratory tract inflammation, all of which are reversible if exposure is ended in time. The chronic effects of beryllium, frequently separated by years from the time of exposure, usually include pneumonitis with a cough, chest pain and general weakness. Heart, spleen and kidney problems may also appear. The safe exposure level for workers is not known. In 1949, working with a minimum of data, an Atomic Energy Com-mission panel set the limit of 2 micrograms/cu m of air. Since that time little research has been done and the level remains the same, although it is not and has never been met by industry. Still it has some effectiveness because since the 1949 AEC standard was instituted, there has been a decline in the incidence of beryllium disease. Research is now oriented toward discovering a possible immunological basis of beryllium disease, which would indicate that some people are much more suscepti-ble than others and showing evidence of berylli-um's carcinogenicity. (Jernigan-Vanderbilt)

METALS IN ASBESTOS CAR-CINOGENESIS,

Wayne State Univ., Detroit, Mich. Dept. of Occu-

pational and Environmental Health. A. K. Roy-Chowdhury, T. F. Mooney, Jr., and A. I. Reeves

Archives of Environmental Health, Vol 26, No 5, 253-255, May, 1973. 5 tab, 14 ref. 2-RO-1-ECp 255-25 00240-6.

Descriptors: *Metals, *Asbestos, *Analytical techniques, Spectroscopy, Methodology, Laboratory tests, Public health, Industrial wastes, *Trace elements, *Pollutant identification, *Air pollution.

Identifiers: Carcinogenic.

Concentrations of trace metals judged potentially carcinogenic were determined in samples of amosite, crocidolite, and chrysotile. The samples included commercial material as shipped, milled and processed material as collected in animal ex-posure chambers, and International Union Against Cancer (UICC) reference samples. The metals determined were cobalt, nickel, chromium, manganese, and iron. The samples were treated with hydrofluoric acid, the residue taken up with hydrochloric acid, and the determination made by atomic absorption spectrometry. Substantial en-richment of the dusts in nickel and chromium during milling and dissemination was found. Cobalt and nickel content was different from that in UICC samples. (Rowe-Vanderbilt) W74-12488

RESPONSE OF CYANIDE ION SELECTIVE MEMBRANE ELECTRODES IN THE PRESENCE OF METAL IONS,

Rome Univ., (Italy). Instituto di Chemica Analitica.

M. Mascini, and A. Napoli.

Analytical Chemistry, Vol 46, No 3, p 447-449, March, 1974, 4 fig, 9 ref.

Descriptors: Measurement, *Cyanide, *Metals, Chemical reactions, *Analytical techniques, Testing procedures, Cadmium, Zinc, Nickel, Aqueous solutions, *Ions, *Pollutant identification.

The presence of cations was studied and general equations were derived, taking into account the influence of any cyanide complexes on the response of selective membrane electrodes. The measurements were carried out by using iodide, bromide and chloride electrodes Sens-ion AMEL, made of a heterogenous membrane of silver halide and polythene molded to a polythene; the reference electrode was a double junction SCE filled with KN03 M. The solutions of the metal ions were added to the cyanide solutions. The value of pH was measured with a glass electrode and was regu-lated between 6 and 8 with NH03 or NaOH. The properties of these electrodes are discussed. (Jernigan-Vanderbilt) W74-12489

DETERMINATION OF CHROMIUM IN BIOLOGICAL SAMPLES USING CHEMILU-MINESCENCE, Georgia U.S.

Georgia Univ., Athens. Dept. of Chemistry. R. T. Li, and D. M. Hercules. Analytical Chemistry, Vol 46, No 7, p 916-919, June, 1974. 2 fig, 6 tab, 21 ref. NIH (GM-17913).

Descriptors: *Chromium, *Analytical techniques, **Porganic matter, Chemical reactions, Standards, Testing procedures, Laboratory tests, Human physiology, Spectroscopy, Colorimetry, Distribution, *Pollutant identification. Identifiers: *Chemiluminescence

The application of chemiluminescence to the determination of chromium in biological samples as part of a larger program of applying chemilu-minescence methods to biological systems was re-ported. NBS standard reference materials, ported. NBS standard reference materials, orchard leaves and bovine liver were used to check the validity of the method. Neither materials had a 'certified' value reported for Cr; orchard leaves have an uncertified value of 2.3 ppm. Chromium analyses were done on human serum samples and compared with literature data. Pooled serum samples were analyzed by chemiluminescence, atomic absorption and colorimetric methods to compare the three methods. The three methods showed good agreement generally. The results demonstrated that the chemiluminescence ethod, based on light emission catalyzed by Cr (III) in the luminol-hydrogen peroxide reaction, is applicable to the analysis of chromium in biological media with greater selectivity and using smaller samples. (Jernigan-Vanderbilt)

Identification Of Pollutants-Group 5A

W74-12496

CHARACTERISTICS OF BACTERIOPLANK-TON OF THE URAL RIVER IN THE ORENBURG REGION, (IN RUSSIAN), Gosudarstvennyi Meditsinskii Institut, Orenburg (USSR). Dept. of Biology. For primary bibliographic entry see Field 5C.

W74-12497

X-RAY PHOTOELECTRON SPECTRA OF LEAD OXIDES,

LEAD OXIDES, Purdue Univ., Lafayette, Ind. Dept. of Chemistry. K. S. Kim, T. J. O'Leary, and N. Winograd. Analytical Chemistry, Vol 45, No 13, p 2214-2218, November, 1973. 3 fig. 1 tab. 29 ref. NAS (GP-37017X) AFOSR (AFOSR-72-2238).

Descriptors: *Lead, *Oxides, *X-ray spectroscopv. *Analytical techniques. Inorganic compounds. Oxygen, Crystals, Electrochemistry, *Pollutant identification

X-ray photoelectron spectroscopy (ESCA) spectra of seven different lead-oxygen species were examined including adsorbed oxygen on lead, two crystal forms of PbO, Pb304, Pb02, and two forms of adsorbed water on Pb02. The spectrum of Pb304 exhibited the behavior of two PbO molecules and one PbO2 molecule although specific characterization of the crystal structure of PbO in Pb304 could not be made. The binding energies of the Pb 4f electrons in Pb02 were found to be lower than those of the Pb 4f electrons in PbO. The apparent reversal was rationalized in terms of a relaxation effect. Two kinds of adsorbed water were also found on PbO2. These were explained in terms of a surface adsorbed water species and a water or hydroxyl species which occupied lattice vacancies near the surface. These spectra were then used to characterize electrochemically generated PbO2. (Jernigan-Vanderbilt) W74-12498

ELECTRON SPECTROSCOPY (ESCA): USE FOR TRACE ANALYSIS,

Georgia Univ., Athens. Dept. of Chemistry D. M. Hercules, L. E. Cox, S. Onisick, G. D. Nichols, and J. C. Carver. Analytical Chemistry, Vol 45, No 11, p 1973-1975, September, 1973. 2 fig, 12 ref. NSF (GP-32484).

Descriptors: *Spectroscopy, *Trace elements, *Analytical techniques, Heavy metals, Laboratory Testing procedures, Filters, *Pollutant tests. identification. Identifiers: *Electron spectroscopy.

Glass surfaces coated with the dithiocarbamate group were used to analyze for trace quantities of heavy metals. This type of surface was produced by treating glass fiber with an amino functional silylizing reagent and subsequently with carbon disulfide and sodium hydroxide to form the dithiocarbomate which is capable of reacting with heavy metals as a chelating agent. Application of various chelating functional groups to glass fiber surfaces can be accomplished by conventional synthetic organic techniques once the initial silylising function has been attached. Electron spectroscopy sensitivities are comparable for most elements. Therefore, combining the scope of conventional chelate chemistry, the ease of synthesis of chelating functional groups and the wide applicability of ESCA as a measuring device, the electron spectroscopy-glass fiber disk technique appears to be one of very general utility. (Jernigan-Van-W74-12499

DETERMINATION OF TRACE ELEMENTS IN COAL, FLY ASH, FUEL OIL, AND GASOLINE- A PRELIMINARY COMPARISON SELECTED ANALYTICAL TECHNIQUES, National Environmental Research Center, Research Triangle Park, N.C. Quality Assurance and Environmental Monitoring Lab.

D. J. Von Lehmden, R. H. Jungers, and R. E. Lee, Ir

Analytical Chemistry, Vol 46, No 2, p 239-245, February, 1974. 6 tab, 8 ref.

Descriptors: *Analytical techniques, *Trace elements, *Spectroscopy, *Mass spectrometry, Mer-cury, Beryllium, Lead, Cadmium, Arsenic, Manganese, Chromium, Statistical analysis, *Pollutant identification, *Air pollution.
Identifiers: Laboratory comparisons.

The Environmental Protection Agency has initiated a program to monitor trace elements in fuels and related emissions to the atmosphere. As part of this program, nine laboratories using similar analytical methods were asked to determine the concentration of 28 elements in the same fuel and fly ash matrices. Among the elements investigated were mercury, beryllium, lead, cadmium, arsenic, vanadium, manganese, chromium, and fluorine. The analytical methods used included neutron activation analysis, atomic absorption, spark source mass spectrometry, optical emission spectrometry, anodic stripping voltam-metry, and X-ray fluorescence. The results from the inter-laboratory comparison were evaluated to assess the comparability of various methods as applied to these matrices. The wide range in reported concentrations indicates that different sample preparation and analytical techniques can lead to erroneous results and points out the need for developing standard reference materials certified in trace elements which can be used for analytical methods evaluation and quality control. (Jernigan-Vanderbilt) W74-12500

DETERMINATION OF SOLUBLE CADMIUM, LEAD, SILVER, AND INDIUM IN RAINWATER AND STREAM WATER WITH THE USE OF FLAMELESS ATOMIC ABSORPTION,

Illinois State Water Survey, Urbana.

A. Rattonetti

Analytical Chemistry, Vol 46, No 6, p 739-742, May, 1974. 2 fig, 4 tab, 12 ref. AEC-1199 and USBR 14-06-D-7197.

Descriptors: Rain water, Streams, *Analytical techniques, *Spectroscopy, *Heavy metals, *Cadmium, *Lead, *Silver, Laboratory tests, Testing procedures, Toxicity, Instrumentation, Pollutant identification.

*Atomic absorption spectroscopy, Identifiers:

Using stream water and rainwater, this study found interferences in the direct determination of: (1) the environmentally hazardous metals, cadmium and lead, and (2) silver and indium, metals which are used in meteorological research. How the interferences were eliminated in flameless atomic absorption tests is described. The precision of triplicate determinations was plus or minus 5% when the amount of analyte dispensed on the heater ribbon was ten times the absolute detection limit. Argon purging, temperature for drying the sample and volatilization, solvent extraction and additives to keep ions in solution were investigated to cut down on interferences. (Jernigan-Van-W74-12501

LOSSES OF TRACE CONCENTRATIONS OF CADMIUM FROM AQUEOUS SOLUTION DUR-ING STORAGE IN GLASS CONTAINERS, ING STURAGE IN GLASS CONTAINERS, Idaho Univ., Moscow. Dept. of Chemistry. W. G. King, J. M. Rodriguez, and C. M. Wai. Analytical Chemistry, Vol 46, No 6, p 771-773, May, 1974. 3 fig, 8 ref. Descriptors: *Cadmium, 'Aqueous solutions, Storage, *Adsorption, Pollutants, Tracers, Laboratory tests, Testing procedures, *Trace elements, *Pollutant identification.

This study was undertaken to determine the magnitude of as well as the mechanism for the loss of cadmium from water samples stored in various containers. Losses of cadmium in solutions of dif-ferent concentration and pH were measured with respect to time. Radioactive Cd-109 (half-life 470 days) was employed as a tracer for this study. Losses of cadmium from aqueous solution during storage appeared to depend upon at least three parameters: container material, pH of solution, and concentration of cadmium. (Jernigan-Vanderbilt) W74-12502

METAI. CONTAMINATION OF URBAN

METAL CONTAMINATION OF URBAN WOODY PLANTS, Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies. For primary bibliographic entry see Field 5B. W74-12506

ATOMIC ABSORPTION PROCEDURE FOR ANALYSIS OF METALS IN ATMOSPHERIC PARTICULATE MATTER,

Arizona Univ., Tucson. Dept. of Chemistry.
L. E. Ranweiler, and J. L. Moyers.
Environmental Science and Technology, Vol 8, No 2, p 152-156, February, 1974. 1 fig, 4 tab, 14

Descriptors: *Analytical techniques,
*Spectroscopy, *Metals, Sampling, Trace ele-Descriptors: ments, *Testing procedures, *Air pollution, Fil-ters, *Pollutant identification.

A procedure has been developed for the multielement analysis of atmospheric particulate matter by atomic absorption spectrometry. Atmospheric par ticulate samples are collected on polystyrene fil-ters using hi-vol samplers. The filters are dry ashed at 400-425C and the residue is dissolved with a mixture of HF, HCl, and HNO3 in Teflon acid digestion bombs. With the appropriate dilutions and matrix corrections, it is possible quantitatively to measure 22 metals in atmospheric particulate to measure 22 metals in atmospheric particulate matter. The elements measured by this procedure are Si, Al, Ca, Fe, K, Na, Mg, Pb, Cu, Ti, Zn, Sr, Ni, V, Mn, Cr, Rb, Li, Bi, Co, Cs, and Be. Although it is possible to observe Cd in samples collected and prepared by this technique, it is probable that Cd is partially volatilized during ashing of the sample. Recovery data for the ashing and dissolution of expublic parallel safety to the and dissolution of synthetic samples added to the filter material are presented. Data are also presented for the atmospheric concentration of elements in particulate samples analyzed by this procedure. (Jernigan-Vanderbilt) W74-12508

CONCENTRATION MERCURY IN WATER, SEDIMENTS AND FAUNA OF AN AREA OF THE TYRRHENIAN COAST,

Siena Univ. (Italy). Inst. of Comparative Anato-

For primary bibliographic entry see Field 5B. W74-12509

'NORMAL' LEAD AND CADIUM CONTENT OF THE HUMAN KIDNEY,

Veterans Administration Hospital, Birmingham, Ala, Trace Metals Lab. For primary bibliographic entry see Field 5C. W74-12517

INDICATOR SPECIES IN THE DESMID STAU-RASTRUM.

Connecticut Univ., Storrs. Inst. of Water Resources.

Group 5A-Identification Of Pollutants

Available from the National Technical Informa-Available 170m the National Technical Information Service, Springfield, Va 22161 as PB-236 059; \$3.00 in paper copy, \$2.25 in microfiche. Completion Report, 1974. 10 p, 5 tab. OWRT A-047-CONN(1). OWRR 14-31-0001-3807.

Descriptors: *Bioindicators, Aquatic algae, *Cultures, *Growth rates, Phosphorus, Carbon dioxide, Pollutant identification. Identifiers: *Staurastrum, *Desmid, *Axenic culture, Defined inorganic medium, Buffers.

A Staurastrum sp. has been cultured for the first time in uni-algal, bacteria-free culture in a defined, low salts, inorganic medium. Carbon dioxide was found to be a limiting factor for the organism's growth in axenic laboratory culture. Glycylglycine (80 mg/100 ml) was found to be an effective buffer, counteracting the acid pH levels created by carbon dioxide bubbling. The lack of sensitivity of Staurastrum growth rates to small changes in phosphate concentration made this organism a poor indicator of the nutrient condition of natural waters. (deLara-Connecticut) W74-12597

OIL/WATER INTERFACE DETECTOR LABORATORY EVALUATION,

Esso Research and Engineering Co., Florham,

J. J. Heigl.

Available from NTIS, Springfield, Va 22161 as COM-74-10120, Price \$4.00 printed copy; \$2.25 microfiche. Final Contract Report EE.11TRM.73, Maritime Administration, 1973. 90 p, 18 fig, 3 tab, 26 ref, 2 append. C-1-35049.

Descriptors: *Pollutant identification, *Oily water, *Instrumentation, *Oil spills, Conductivity, Resistivity, Acoustics, Water pollution, Ships, Pollution abatement.

For measuring oil-in-water in tanker operation, three devices were tested. The devices were based on acoustic attenuation, sonic velocity, and electrical conductivity. None of the devices, as supplied by the manufacturers, could meet the desired performance. The electrical conductivity device was insensitive to changes in oil concentration in the 0 to 1% oil range. The sonic attenuation device gave outputs which increased with oil content in the 0 to 1% range but sensitivity varied widely and it was not possible to get reproducible results. The sonic velocity device was more sensitive but was affected by variations in specific gravity, salinity and impurities and required control of temperature and pressure. (Knapp-USGS) W74-12637

AIR POLLUTION FROM FUEL COMBUSTION IN STATIONARY SOURCES.

Processes Research, Inc., Research Triangle Park, N.C. Industrial Planning and Research. For primary bibliographic entry see Field 5G. W74-12640

THE DETERMINATION OF OIL SLICK THICKNESS BY MEANS OF MULTIFREQUENCY PASSIVE MICROWAVE TECHNIQUES, Naval Research Lab., Washington, D.C

J. P. Hollinger.

J. P. Hollinger. Available from NTIS, Springfield, Va. 22161 as AD-771 376, Price \$3.50 printed copy, \$2.25 microfiche. Interim Report No 7110-1 to US Coast Guard, June 15, 1973. 68 p., 38 fig, 1 tab, 21 ref. USCG Contract Z-70099-2-21881.

Descriptors: *Oil spills, *Oily water, *Remote sensing, *Microwaves, *Pollutant identification,

The thickness and volume of sea surface oil spills was studied using multifrequency microwave radiometry. Aircraftborne measurements were made at 19.3 and at 31.0 or 69.8 GHz of eight controlled marine oil spills. The spills consisted of from 200 to 630 gallons of either No. 2 fuel oil or No 4 or No 6 crude oil. The microwave measureno. 4 of No. 6 crude oil. The microwave measure-ments of all of the oil spills of each oil type showed very similar results. The slicks always formed an identifiable region with film thicknesses of a millimeter or more and containing the majority of oil which was surrounded by a very much larger and thinner slick which contained very little of the oil. In general the thick region contained more than 90% of the oil in less than 10% of the area of the visible slick. It was always possible to locate and delineate the thick region solely from the microwave observations. The total volume of oil present derived from the microwave measure-ments was within about 25% of the volume of oil spilled. Microwave radiometry should prove a useful tool in the confinement, control, and clean up of marine oil spills. (Knapp-USGS)

BIOASSAY DILUTER CONSTRUCTION,

Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office. H. W. Jackson.

Available from NTIS, Springfield, Va. 22161 as PB-224 436, Price \$6.50 printed copy, \$2.25 microfiche. Training Manual EPA-430/1-73-007, June 1973. 84 p, 18 plates, 7 tab, 4 append.

Descriptors: *Bioassay, *Equipment, Water pollution, Chemical analysis, Laboratory tests, Bioindicators, *Training, *Publications, Pollutant

This manual is designed to supplement tutorial instruction and published literature describing the design and construction of various types of flow-through bioassay and biomonitoring equipment. Illustrations, tables of design values, list of materials needed, and reprints of significant publications from technical journals are included. (Knapp-W74-12646

WATER QUALITY CRITERIA 1972, A REPORT OF THE COMMITTEE ON WATER QUALITY CRITERIA.

National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Board.

For primary bibliographic entry see Field 5G. W74-12674

RESEARCH NEEDS IN WATER QUALITY CRITERIA, 1972.

National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Board.
For primary bibliographic entry see Field 5G.
W74-12675

BIOGEOCHEMISTRY OF THE RARE-EARTH ELEMENTS IN AQUATIC MACROPHYTES OF LINSLEY POND, NORTH BRANDFORD, CON-NECTICUT.

Pittsburgh Univ., Pa. Dept. of Biology.

U. M. Cowgill. Geochim Cosmochim Acta. Vol 37, No 10, p 2329-2345, 1973, Illus

Descriptors: Trace elements, Aquatic plants, Effects, Vegetation effects, Environmental effects, Connecticut, X rays.

Identifiers: Aluminum, Ceratophyllum-demersum, Cesium, Decodon-verticillatus, Dysprosium, Erbium, Lanthanum, Macrophytes, Nuphar-advena, Pontederia-cordata, Nymphaea-odorata, Potamogeton-crispus, Potamogeton-praelongus, Praseodymium, Rare-earth, Samarium, Spectroscopy, Ytterbium, Yttrium, Neodymium.

Aquatic plants (Nymphaea odorata, Nuphar advena, Potamogeton praelongus, P. crispus,

Ceratophyllum demersum, Pontederia cordata, Decodon verticillatus), water, lake mud, soils and rocks from Linsley Pond (Connecticut) were analyzed for all the naturally occurring elements of the periodic table which could be detected by optical and X-ray emission spectroscopy. In the course of this study, it was noted that all the rare earths of even atomic number were detected; of the odd-numbered members of the group only La and Pr were found. The others were presumably present in amounts below detection. These elements relative to their concentration in the soils and rocks of the basin are absorbed by plants, giving an enrichment of about 100-fold relative to Al on a dry weight basis. Samarium is present in excess of Nd in the rooted emergent plants but not in the submerged rooted or rootless ones. There is some suggestion of a fractionation of the rare earths in different parts of the plants. A comparison of the relative accumulation of trace elements with their content in the sediment suggests that Y, La, Ce, Pr, Sm, Dy, Er and Yb may be essential trace elements .-- Copyright 1974, Biological Abstracts, Inc. W74-12687

AUTOMATED GAS CHROMATOG ANALYSIS OF SULFUR POLLUTANTS, Varian Aerography, Walnut Creek, Calif. R. E. Pecsar, and C. H. Hartmann. CHROMATOGRAPHIC

J Chromatogr Sci. Vol 11, No 9, p 492-502. 1973.

Descriptors: *California, *Pollutant identification, Analytical techniques, *Flame photometry, Pulp and paper industry, Oil industry, Electric power industry, Fossil fuels, *Gas chromatography, Chromatography, Chemical analysis, *Air pollu-tion, *Sulfur. Identifiers: *San-Francisco Bay.

The analysis of sulfur-containing pollutants is becoming mandatory in operations such as kraft paper mills, fossil burning power generation and paper mins, lossil ourning power generation and the petrochemical refining industry. Gas chromatography is a versatile tool for accomplishing this analysis in the normal ppb to ppm concentration range. Typically an all-Teflon flow system is employed with detection by flame photometry. Results are presented showing individual com-ponent as well as total system optimization. This includes consideration of column technology, detector gas flow rates and electrical operating parameters. The best column fabrication means are discussed with methods for achieving optimum are uncussed with methods for achieving optimum column and detector operation. For the low level analysis of sulfur pollutants the importance of design attention to the entire system is stressed. The practical application of all these considera-tions is demonstrated with monitoring data obtained on industrial stationary sources in the San Francisco Bay Area. An analyzer embodying the desired characteristics can be mated with an automated sequence programmer to provide continu-ous analysis and intermittent calibration completely unattended .-- Copyright 1974, Biological Abstracts, Inc. W74-12690

COXSACKIEVIRUS B EPIDEMIC AT A BOYS' SUMMER CAMP: ISOLATION OF VIRUS FROM SWIMMING WATER,

Vermont Univ., Burlington. H. B. Hawley, D. P. Morin, M. E. Geraghty, J. Tomkow, and C. A. Phillips. Jama J Am Med Assoc. Vol 226, No 1, p 33-36.

1973. Illus

Descriptors: Lakes, Water sports, *Recreation facilities, Camping, *Viruses, Diseases, Bestiphors. Lakes, Tolking Springs, Viruses, Diseases, Swimming, Vermont. Identifiers: *Lake Champlain, Coxsackievirus, Enteroviruses, Picornavirus, Polyelectrolyte 60.

During an outbreak of coxsackievirus B5 at a boys' summer camp located on Lake Champlain,

Sources Of Pollution—Group 5B

virus was successfully isolated for the 1st time from a large body of recreational water. This was accomplished by using polyelectrolyte 60 to concentrate the virus. Polyelectrolyte 60 was also used in the isolation of viruses from clinical specimens obtained from campers and staff who had a wide variety of clinical syndromes. Virus present in lake swimming water may play in important role in some enterovirus outbreaks.—Copyright 1974, Biological Abstracts, Inc. W74-12698

APPLICATION OF THE FISSION-TRACK TECHNIQUE TO THE DETERMINATION OF URANIUM IN NATURAL WATERS, Kyushu Univ., Fukuoka (Japan). Dept. of Chemis-

try. T. Takebayashi, H. Matsuda, and S. Umemoto. Talanta. Vol 20, No 9, p 892-895. 1973.

Descriptors: *Analytical techniques, *Uranium radioisotopes, *Radiochemical analysis, Evaporation, Rivers, *Natural streams, *Pollutant identification

Identifiers: Fission-track analysis, *Japan, Uranium.

A procedure for the determination of the U content of natural waters is presented. To 100 ml of natural water, 200 ml of concentrated HCl are added and this solution passed through a 6-ml column of Dowex 1-X8. The U is eluted with 60 ml of 0.1 M HCl and the eluate is evaporated to dryness. The residue is subjected to the fission-track technique described previously. The U content of the river waters in Fukuoka City, Japan was determined.—Copyright 1974, Biological Abstracts, Inc. W74-12720

CLASSIFICATION AND COMMUNITY STRUCTURE OF MACROBENTHOS IN THE HAMPTON ROADS AREA, VIRGINIA,

Virginia Inst. of Marine Science, Gloucester Point. D. F. Boesch.

Mar Biol (Berl). Vol 21, No 3, p 226-244, 1973. Illus.

Descriptors: *Benthos, *Virginia, *Aquatic plants, Benthic fauna, Water pollution, Mud, Sands, *Classification.
Identifiers: Macrobenthus.

Benthic macrofauna was sampled by grab at 16 stations in Hampton Roads and the adjacent stations in Hampton Koaus and the adjacent Elizabeth River, Virginia, USA. Samples were taken in Feb., May and Aug. Sampling sizes and species were grouped by a classification strategy which basically consisted of the Canberra metric dissimilarity measure and flexible and group average clustering. Following reallocations, 8 site groups and 16 spp. groups instructively classified the 47 sites and 93 spp. considered in the analysis. The sites were grouped into 'associations' on mud, muddy-sand and sand-bottoms and those in the Elizabeth River. Species groupings distinguished a few species most frequent at Elizabeth River or mud and muddy-sand sites, larger numbers of species restricted to muddy-sand and sand or solely to sand sites, ubiquitous species, epifaunal species which were microhabitat-restricted and seasonal which were microhabital-restricted and seasonal species. An analysis of numerically dominant species in the different associations indicated the relative importance of ubiquitous species and seasonally abundant species. Community structure statistics (species diversity, species richness and evenness) showed difinite spatial and temporal patterns. Diversity was high at sand and muddy-Sand sites and low at mud and Elizabeth Piver sites. This spatial pattern was predominatly. River sites. This spatial pattern was predominantly one of species richness. At Elizabeth River and mud stations, diversity increased from Feb.-Aug. because of increased evenness, while at sand and muddy-sand stations, diversity peaked in May in response to both high species richness and high evenness. The applicability of community con-cepts, the causes of substrate specificity,

seasonality and species diversity and the effects of pollution on community structure are discussed.--Copyright 1974, Biological Abstracts, Inc. W74-12727

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METABOLISM OF COMPONENTS OF EXTENDED AERATION ACTIVATED SLUDGE, Oklahoma State Univ., Stillwater. School of Civil Engineering. For primary bibliographic entry see Field 5D. W74-12001

SURFACE-WATER INVESTIGATIONS ON THE LUMMI INDIAN RESERVATION, WASHINGTON

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 4A. W74-12008

ECOLOGY AND ANALYSIS OF TRACE CON-TAMINANTS - PROGRESS REPORT, JANUARY 1973-SEPTEMBER 1973.

1973-SEPTEMBER 1973.
Oak Ridge National Lab., Tenn.
Available from NTIS, Springfield, Va 22161 as
Rept No ORNL-NSF-EATC-6, \$10.60/copy,
\$2.25/microfiche. Report No ORNL-NSF-EATC-6,
January 1974. W. Fulkerson, W. D. Shults, and
R. I. Van Hook, editors. 450 p, 84 fig, 70 tab, 246
ref. NSF AG 389.

Descriptors: Toxicity, *Assessment, *Trace elements, *Environmental effects, *Effluents, *Measurement, *Abatement, *Water pollution control, Transport depletion, Ion transport, Model studies, Radiation, Environment, Ecology, Ecosystems, Analytical techniques, Information exchange, Data collections, Management.

This is the second progress report of the Oak Ridge National Laboratory Ecology and Analysis of Trace Contaminants Project sponsored by the Environmental Aspects of Trace Contaminants Program of NSF/RANN. The objective is to develop techniques and information which will be useful in assessing the environmental impact of toxic trace substances and in reducing discharges of these materials. The work is not specific to any one trace contaminant, but much of the effort to date has been focused on toxic elements. The research involves five areas: (1) development of a Unified Transport Model for trace contaminants, (2) ecological research to characterize the translocation and accumulation of trace elements in the environment, (3) measurements research to improve analytical efficiency and capability, (4) development of aqueous abatement technology, and (5) information flow and management. (See W74-12022 thru W74-12036) (Houser-ORNL) W74-12021

DEVELOPMENT OF A UNIFIED TRANSPORT MODEL FOR TOXIC MATERIALS,

Oak Ridge National Lab., Tenn.
A. A. Brooks, R. D. Ellison, D. E. Fields, D. D.
Huff, and R. J. Luxmoore.
In: Report No ORNL-NSF-EATC-6, p 43-92,
January 1974. 15 fig, 3 tab, 41 ref.

Descriptors: *Model studies, *Hydrologic models, *Sediment transport, *Settling, Velocity, *Deposition(Sediments), *Ion exchange, Movement, *Path of pollutants, Soils, Soil moisture, Absorption, Transpiration, Chemical reactions, Streams, Air pollution, Fallout, Infiltration, Transfer precipitation(Atmospheric), Environmental effects, Public health, Watershed management, Ecosystems, Simulation analysis, Missouri, Tennessee.

Identifiers: Walker Branch Watershed(Tenn), Bear Creek Watershed(Tenn), Crooked Creek Watershed(Mo). The purpose of the Unified Transport Model (UTM) is to simulate the movement of a trace contaminant in a watershed ecosystem. Such simulation should be useful in interpolating monitoring data throughout the watershed and in extrapolating behavior over time. The model calculates the input of contaminants from atmospheric sources and the subsequent movement of these with water (and with water-transported solids) in the watershed. During this reporting period the air model was merged with a modified version of the Wisconsin Hydrological Transport Model. Work is in progress to properly account for chemical exchange and to biological translocation. The UTM (or components thereof) is being tested at the ORNL Walker Branch Watershed, at the TVA Bear Creek Watershed, and in collaboration with the University of Missouri at Rolla at the Crooked Creek Watershed in the New Lead Belt of southeastern Missouri. (See also W74-12021) (Houser-ORNL)

ENVIRONMENTAL MONITORING OF TOXIC MATERIALS IN ECOSYSTEMS,

Oak Ridge National Lab., Tenn.
S. H. Anderson, A. W. Andren, C. F. Baes, III, G.
J. Dodson, and W. F. Harris.
In: ORNL-NSF-EATC-6, p 95-139, January 1974.
9 fig. 17 tab. 39 ref

Descriptors: *Monitoring, Environment, Toxicity, *Toxins, *Trace elements, *Water pollution, *Radioisotopes, Ecosystems, Litter, Rain, Groundwater, Groundwater pollution, Ion exchange, Food chains, Cadmium, Chromium, Copper, Nickel, Lead, Zinc, *Tennessee. Identifiers: *Walker Branch Watershed(Tenn).

Preliminary trace-element budgets have been developed for the terrestrial components of Walker Branch Watershed. Of all ecosystem components, the litter layer is most important in accumulating trace elements in this system. A preliminary input/output budget for trace elements through Walker Branch has been constructed and includes trace elements in rainfall. dryfall. throughfall, groundwater, and stream flow. Of the trace metals brought in through rainfall, 8% Cd. 26% Cr. 3.7% Cu, 6.6% Ni, 20.8% Pb, and Zn are removed in dissolved form by stream flow. The input/output measurements required development of some new analytical techniques because of the very low levels of trace elements in rainfall. Because of experience with high molecular weight amines as solvent extractants, these materials were tried and successfully used in concentrating trace elements in the various aqueous samples. (See also W74-12021) (Houser-ORNL)

ECOLOGY OF TOXIC METALS,

Oak Ridge National Lab., Tenn. B. G. Blaylock, E. H. Curtis, R. A. Goldstein, J. W. Huckabee, and C. S. Matti. In: ORNL-NSF-EATC-6, p 140-175, January 1974. 9 fig. 5 tab, 20 ref.

Descriptors: *Toxicity, *Toxins, *Trace elements, Ecology, *Mercury, *Cadmium, Movement, *Path of pollutants, Ecosystems, Absorption, Transfer, Soils, Fish, Vegetation, Litter, Food chains, Identifiers: *Methylmercury.

The objective was to determine the fate of toxic metals in the environment and to provide data for predicting their movement and concentration in different ecosystems. Fish from the Great Smoty Mountain National Park were analyzed for methylmercury and total mercury in order to obtain background levels of mercury for comparison with polluted areas. Approximately 93% of the mercury in these fish was methylmercury. Terrestrial studies compared the movement of cadmium and mercury in an old-field ecosystem. These studies showed that mercury or cadmium entering

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a terrestrial ecosystem from the atmosphere would be transferred rapidly to the soil. The transfer of these elements from vegetation and litter to soil is linear through time. Radiotracer techniques and nnear through time. Radiotracer techniques and stable chemical analyses were used in food-chain studies and to determine the influence of temperature and concentration on the methylmercury uptake in fish. (See also W74-12021) (Houser-ORNL) W74-12024

TOXIC METALS IN SEDIMENTS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12025

CENTRIFUGATION: APPLIED ZONAL. ASPECTS IN ELUCIDATING CHEMICAL AND BIOLOGICAL FORMS, DISTRIBUTION AND AVAILABILITY OF HEAVY METALS IN THE ENVIRONMENT, Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 5D. W74-12026

HYDROLYTIC BEHAVIOR OF TOXIC METALS,

Oak Ridge National Lab., Tenn. R. E. Mesmer, and C. F. Baes, Jr.
In: ORNL-NSF-EATC-6, p 222-239, January 1974. 2 fig, 3 tab, 33 ref.

Descriptors: *Metals, *Ion exchange, Behavior, *Equilibrium, *Hydrolysis, Research and develop-ment, Zinc, Mercury, Copper, Beryllium, Lead, Cadmium, Tin, Arsenic, Antimony, Bismuth, Boron, Scandium, Aluminum, *Chemical reaction.

The sequence of equilibrium reactions of a metal ion with water to form hydroxy complexes is referred to as its hydrolysis behavior. The chemical literature on such behavior for the ions of ten originally selected elements (Zn, Hg, Cu, Be, Pb, Cd, Sn, As, Sb, and Bi) has been critically reviewed. The scope of the project has now been broadened to cover all the metals of the Periodic Table to make available this essential information for all the metallic contaminants encountered from the many diverse industries and sources. Brief summaries of the conclusions drawn for the last five of the above list and also some expressions describing equilibrium behavior for the Group III elements--B, Sc, and Al, are presented. (See also W74-12021) (Houser-ORNL) W74-12027

DEVELOPMENT OF HIGH SENSITIVITY X-RAY FLUORESCENCE FOR ANALYSES OF TRACE TOXIC ELEMENTS,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12028

ENVIRONMENTAL APPLICATIONS OF CENTRIFUGAL PHOTOMETRIC ANALYSIS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12029

SEPARATION, DETECTION, AND IDENTIFICATION OF ORGANICALLY BOUND TOXIC METALS AND OTHER HAZARDOUS MATERI-

ALS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12030

MEASUREMENT OF MOLECULAR ORGANIC CONTAMINANTS IN POLLUTED WATER BY LIQUID CHROMATOGRAPHY,

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12031

RAPID 15-N ISOTOPIC-RATIO ANALYTICAL SYSTEM FOR ENVIRONMENTAL SAMPLES, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5A. W74-12032

RECOVERY OF TOXIC METALS FROM IN-DUSTRIAL EFFLUENT SOLUTIONS BY SOL-VENT EXTRACTION, Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 5D. W74-12033

ELECTROCHEMICAL RECOVERY REDUCIBLE INORGANIC FROM AQUEOUS STREAMS, POLLUTANTS

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5D. W74-12034

TOXIC MATERIALS INFORMATION CENTER, Oak Ridge National Lab., Tenn. Environmental Information Systems Office.
For primary bibliographic entry see Field 10D.

W74-12035

THE FLOW OF MERCURY IN SOCIETY,

Oak Ridge National Lab., Tenn. W F Clark In: ORNL-NSF-EATC-6, p 407-409, January 1974. 2 tab, 1 ref.

Descriptors: *Surveys, *Data collections, *Mercury, *Census, Waste disposal, Sites, Wastes, Toxins, Environment, Federal govern-

Identifiers: *Usages.

The information from questionnaires sent to various government agencies covering mercury usage during 1971 was compiled and a final report has been prepared. The conclusions are as follows: Twenty-three major agencies of the U.S. Government were questioned relative to the quantities of mercury used, usage patterns, amounts recovered and recycled, and final disposal practices. Of these major agencies eight reported negligible usage, twelve submitted essentially complete questionnaires, two submitted limited response, and one promised a limited response which has not been received. Six hundred and seventy-nine responses were obtained from individual sites or subagencies. A breakdown of usage per agency is given. (See also W74-12021) (Houser-ORNL) W74-12036

RADIOACTIVE EFFLUENTS FROM NUCLEAR POWER STATIONS IN THE COMMUNITY; DISCHARGE DATA - RADIOLOGICAL

European Communities, Luxembourg. Commission.

Available from NTIS, Springfield, Va 22161 as NP-19910; \$4/copy, \$2.25/microfiche. Rept No NP-19910, November 1972. 38 p, 12 tab, 20 ref.

Descriptors: *Monitoring, *Radioactivity,
*Effluents, *Nuclear powerplants, *Data collections, Discharge measurement, Gases, Aerosols, Iodine, Liquids, Tritium, Water, Potable water, Surface waters, *Europe.

Literature data for 1969, 1970, 1971 on radioactive waste discharges from the nuclear power stations in the European Community are presented. In the case of gaseous effluents a distinction is drawn between noble gases, aerosols and iodine-131, and in the case of liquid effluents between the total activity (excluding tritium) and tritium alone. The discharge data are compared with the discharge limits for the various power stations. In addition, for the liquid effluents the average yearly concentrations reached in the receiving waterbodies are shown, expressed as a percentage of the maximum permissible concentration in drinking water. An evaluation of maximum exposure around each plant site is made and a ratio of activity discharged to energy produced is given. (Houser-ORNL) W74-12037

DISTRIBUTION, BIOLOGICAL EFFECTS, AND DISTRIBUTION, BIOLOGICAL EFFECTS, AND MIGRATION OF RADIOACTIVE ISOTOPES. Available from NTIS, Springfield, Va 22161 as AEC-tr-7512; \$10.60/copy, \$2.25/microfiche. Atomic Energy Commission Report AEC-tr-7512, April 1974. 412 p, 116 fig, 186 tab, 1 biblio. Trans of Raspredelenie, Biologich eskoe Deistvie i Migratsiya, Radioaktivnykh Izotopov, Moscow 1961

Descriptors: *Radioactivity, *Nuclear energy, *Air pollution, *Water pollution, *Soil contamina-tion, *Water pollution sources, Nuclear explosions, Nuclear powerplants, Effluents, Bio-control, Radioactivity effects, Environmental effects, Human populations, Strontium, Cesium, Barium, Lanthanum, Ruthenium, Plutonium, Yttrium

The scientific community of the world is becoming increasingly concerned with the problems of dis-tribution, increased excretion, biological effects, and migration in the biosphere of radioactive nuclides. This is due to the fact not only of the posnuclaces. Into is due to the fact not only of the pos-sibility of broad use of atomic energy in industry, agriculture, medicine, and scientific research, discovered in the last decade, but chiefly to the progressive increase in radioactive background of progressive increase in radioactive background of earth as a result of nuclear arms testing, which is closely related to the problem of chronic exposure of man to small doses of ionizing radiation and possible appearance of long-term consequences of such exposure. This collection of reports submits data on distribution, accelerated excretion, biological effects, and migration in the biosphere of radioactive isotopes, including such practically important nuclides as cesium-137, strontium-89, strontium-90, barium-140, cerium-144, lanthanum-140, ruthenium-106, plutonium-239, and yttrium-91. (See W74-12039 thru W74-12043) (Houser-DNA) 91. (See ORNL)

MIGRATION OF RADIOACTIVE STRONTIUM IN THE BIOSPHERE - SOME DATA ON RADIOSTRONTIUM AS A FACTOR IN ENVIRONMENTAL CONTAMINATION, A. N. Marei

In: AEC-tr-7512, p 349-358, April 1974. 1 diagram, 1 bibliography.

Descriptors: *Strontium, *Environmental effects, Aquatic environment, Reservoirs, *Potable water, *Fish, Food, Irrigation, *Food chains, Freshwater, Water pollution sources, Path of pollutants, Nuclear explosions, Fallout, Nuclear power-plants, Effluents, Nuclear wastes, Waste disposal, Meteorology.

The chief cause of increased radioactive background is the gradual accumulation on the earth's surface of products of uranium fission, chiefly as a result of nuclear arms tests. In addition, there are local contaminations due to radioactive and the surface of t tive waste. A chief component of the man-made radioactivity on the earth's surface is strontium. At the present time, the quantity of radioactive strontium that has settled from the atmosphere per unit of earth's surface varies. The behavior of long-lived radioactive contaminants that reach the environment is determined chiefly by two processes; dissipation and concentration, and the latter is closely related to biological phenomena, and is important to man. Radioactive fallout from the enormous volume of atmospheric air on the earth's surface could be viewed as a distinctive process of concentration of the entire mixture of radioactive elements in it. The great hygienic sig-nificance of this problem makes it imperative to continue investigation of the patterns of behavior

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of strontium under diverse environmental conditions and to conduct precise quantitative estima-tion of its effects on man. (See also W74-12038) (Houser-ORNL) W74-12039

SOME DATA ON MOVEMENT OF RADIOS-TRONTIUM WITH GROUNDWATER CUR-

RENT, A. S. Belitskii, E. I. Orlova, and A. I. Ryzhov. In: AEC-tr-7512, p 359-367, April 1974. 4 fig, 4 tab, 1 bibliography.

Descriptors: *Strontium, *Groundwater movement, *Migration, Migration patterns, Distribu-tion, Water flow, Absorption, Desorption, Sands, *Path of pollutants, *Radioisotopes.

Migration of radiostrontium in ground water is a rather complex process related to factors men-tioned below. These factors must be taken into consideration when defining the size of the sanitary safety area around sources of radioactive con-tamination. To date, processes of migration of radioactive substances in underground water have not been sufficiently investigated, so that there must be significant expansion in the future of field and laboratory experimental investigations in this area. The more important factors to consider in the movement of radiostrontium with groundwater currents are: (1) It is distributed chiefly in the direction of water flow. (2) Most of the radioactive strontium contained in groundwater is sorbed by sand near the contamination site. (3) Radioactive strontium absorbed by sand may re-enter groundwater as a result of desorption. (See also W74-12038) (Houser-ORNL) W74-12040

EFFECTS OF RADIOACTIVE STRONTIUM ON MICROFLORA OF WATER AND ON MINERALIZATION PROCESSES OF ORGANIC

SUBSTANCES, For primary bibliographic entry see Field 5D. W74-12041

ACCUMULATION OF STRONTIUM-90 IN YOUNG CARP.

G. D. Lebedeva In: AEC-tr-7512, p 375-378, April 1974. 3 tab, 1

Descriptors: *Strontium, *Radioisotopes, Oceans, Sea water, Bodies of water, *Fish, *Aquatic life, *Radioactivity, *Absorption, Digestion, Specia-tion, Assessment, Assay, *Carp.

The use of radioactive isotopes in the national economy and in scientific research could, in spite of precautionary measures, lead to contamination of bodies of water. In view of this, many works have been published in recent times dealing with accumulation of radioisotopes in fresh and salt water organisms. Aquatic organisms have the capacity of accumulating radioactive substances with varying intensity. The rate of accumulation depends on the type of radioactive element, as well as species and physiological state of the or-ganism. The objective of this work was to determine the rate of accumulation of radioisotopes by very young, 2-week-old fish, as well as to compare the intensity of radioisotopes accumulation in young fish of different species. (See also W74-12038) (Houser-ORNL) W74-12042

DISTRIBUTION, ELIMINATION, AND COEFFI-CIENTS OF ACCUMULATION OF STRONTI-UM-90, CESIUM-137, AND PHOSPHORUS-32 IN FISH, D. I. Il'in, and Yu. I. Moskalev.

In: AEC-tr-7512, p 379-387, April 1974. 6 tab, 1

*Reservoirs. *Public Descriptors: health. Descriptors: "Reservoirs, "Public health, *Radioactivity, *Fish, *Food chains, *Human population, Bio-control, Assay, *Radioisotopes, Rates, Strontium, Cesium, Phosphorus, Aquatic environment, Transfer, Ion exchange, pollutants, Distribution, Transmissivity.

In response to the need to make a hygienic evaluation of the harmfulness of radioactive radiations, investigation of migration of radioactive elements of different biological chains, particularly those ending with man, is gaining much importance. Fish are an important element in one of these biological chains. Like numerous other living organisms, they have the capacity to concentrate radioactive substances, and for this reason they can be in-volved in transfer activity from the environment into the human body. Data are submitted on distribution, elimination, and coefficients of accumulation of strontium-90, cesium-137, and phosphorus-32 in organs of fish inhabiting a natu-ral reservoir. (See also W74-12038) (Houser-W74-12043

ENVIRONMENTAL SURVEILLANCE AT HAN-

FORD FOR CY-1973,
Battelle-Pacific Northwest Lab., Richland, Wash.
Occupational and Environmental Safety Dept.

Occupational and Environmental Safety Dept.

W. L. Nees, and J. P. Corley.

Available from NTIS, Springfield, Va 22161 as
Rept No BNWL-1811; \$5.45/copy,
\$2.25/microfiche. Report No BNWL-1811, April
1974. 78 p, 14 fig, 22 tab, 21 ref, 5 append.

Descriptors: *Radioactivity, *Monitoring, Environment, *Sites, *Sampling, Analysis, Surface water, Groundwater, Air, Foods, Soils, Vegetation, Columbia River, Nuclear powerplants, Effluents, Safety, Evaluation, *Washington. Identifiers: *Hanford Site(Wash).

The 1973 Hanford Environmental Surveillance Program showed continued compliance of the Hanford contractors and their operations with applicable environmental standards. Samples of surface water, groundwater, air, foodstuffs, soil, and vegetation were collected and analyzed for radioactivity. Columbia River water also received chemical and biological analysis. Additionally, measurements were made of river immersion exposure rate, surface exposure rate (1 meter above soil surface), and radionuclide deposition on soil surfaces and highways open to public access. The shutdown of the last of the single-pass cooled production reactors (KE) in January of 1971 eliminated the major remaining source of population exposure from Hanford operations. In 1973, the average river radionuclide concentrations were less than 0.5% of the Concentration Guides for all identified radionuclides. Detail data are given. (Houser-ORNL) W74-12044

A SURVEY OF UNIQUE TECHNICAL FEATURES OF THE FLOATING NUCLEAR POWER PLANT CONCEPT.

Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 5C.

ENVIRONMENTAL MONITORING REPORT FOR SANDIA LABORATORIES FOR 1973,

Sandia Lab., Albuquerque, N. Mex. L. W. Brewer.

Available from NTIS, Springfield, Va 22161 as Rept No SLA-74-0167; \$4/copy, \$2.25/microfiche. Report No SLA-74-0167, April 1974, 26 p. 1 fig. 2 append.

Descriptors: *Monitoring, Environment, *Air pollution, *Water pollution, *Radioactivity, Water pollution sources, Soil contamination, Environmental effects, Environmental control, Sampling,

Data collections, Regulation, Vegetation, Potable water, *New Mexico.
Identifiers: *Sandia Laboratories(N Mex).

Water, soil, and vegetation are regularly moni-tored by several different methods and the results analyzed to assure that Sandia Laboratories operations are not adversely affecting the surrounding environment. The radiation levels are presented for the year 1973. Based upon the environmental sampling data presented, Sandia Laboratories has not released any significant amount of radioactive contaminants to the environment during the period from January 1, 1973, through December 31, 1973. The 1973 data on soil radioactivity by comparison with previous years activity levels (obtained be-fore the start of the two reactor facilities) and the vegetation data on the average have remained rela-tively constant. Water-sampling data show activity of less than the 1 x 10(minus 7) microCi Beta/ml of drinking water, which is the standard recom-mended for identified radionuclides according to AEC Manual Chapter 0524. (Houser-ORNL)

TEMPERATURE EFFECTS ON THE SORPTION OF RADIONUCLIDES BY AQUATIC ORGAN-ISMS

Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 5C. W74-12048

RADIOACTIVITY AND HUMAN DIET. For primary bibliographic entry see Field 5C. W74-12049

FOOD CHAINS IN FRESH WATER, Battelle-Pacific Northwest Lab., Richland, Wash. Biology Dept. or primary bibliographic entry see Field 5C. W74-12050

GROUNDWATER RESOURCES OF THE HOL-LYWOOD AREA, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 4B.

W74-12054

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES, PARTS I AND II.

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2L. W74-12057

INDICATORS OF ORGANIC CONTAMINA-TION IN PLANTATION CANAL, BROWARD COUNTY, FLORIDA, 1971-72,

Geological Survey, Tallahassee, Fla. T. N. Russo.

Florida Bureau of Geology, Tallahassee Report of Investigations No 70, 1974. 38 p, 18 fig, 8 tab, 20

Descriptors: *Water pollution, *Canals, *Florida, Water pollution sources, Municipal wastes, Water pollution effects, Biochemical oxygen demand, Dissolved oxygen, Eutrophication, *Bioindicators Identifiers: *Ft. Lauderdale(Fla).

The principal source of the organic materials in Plantation Canal, Fort Lauderdale, Florida, is effluent from sewage treatment plants. The waters of Plantation Canal contain large quantities of oxygen-demanding wastes and plant nutrients. Dis-solved oxygen probably reaches zero just above the bottom sediments. When conditions are anoxic, anaerobic decomposition produced objectiona-ble odors. The high concentrations of nutrients result in luxuriant growth of algae and floating

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aquatic plants. These plants may discolor the aquatic plants. These plants may discord water, inhibit flow and exert an oxygen demand when respiring and undergoing decomposition. Human wastes and, possibly, pathogenic bacteria are present. The bottom sediments in both Plantation Canal and South New River Canal exert an oxygen demand upon the overlying waters. They also contain high levels of plant nutrients, metals and pesticides that may be released into the over-lying waters. The bottom sediments in Plantation canal are composed of highly decomposed and stabilized sludges. The composition of the benthic communities reflects the quality of the bottom sediments and overlying waters. (Knapp-USGS)

A FEASIBILITY STUDY OF USING REMOTE-LY SENSED DATA FOR WATER RESOURCE

MODELS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2A.

WATER QUALITY AND RELATED STUDIES. JACKSONVILLE AREA, FLORIDA,

Geological Survey, Tallahassee, Fla. R. W. Fairchild, and G. W. Leve. Open-file report (Florida 73035), 1973. 34 p 11 fig, 5 tab 10 ref

Descriptors: *Water quality, *Urban hydrology, *Florida, Sampling, Stream gages, Streamflow, Landfills, Water pollution sources, Path of pollutants, *Hydrologic data, Basic data collections. Identifiers: *Jacksonville(Fla), Duval Coun-Identifiers: tv(Fla).

The water resources in the Jacksonville area, Florida, have been studied since 1960. Several studies have dealt with the water quality of streams. The U.S. Geological Survey operates 10 streamflow and sampling stations at various places on the St. Johns River. A water-quality monitor on the St. Johns River at the Main Street Bridge records hourly temperature, dissolved oxygen, pH and specific electrical conductance of the water in the river. The hourly and daily maximum, minimum and mean values of each parameter are tabulated on a computer printout. Studies are being made that will be useful for selecting and monitoring sanitary landfill sites. Geohydrologic data are presented on maps that will be useful in determining the suitability of a site for sanitary landfills or septic tanks. A comprehensive water-quality management plan is underway to identify the quality of existing receiving waters before pollution. Headwaters of eight streams in Duval County are sampled to obtain water-quality information for the city of Jacksonville in its pollution abatement program. (Knapp-USGS) W74-12077

WEATHERING: PETROLEUM SOME PATHWAYS, FATE, AND DISPOSITION ON MARINE WATERS,

Pacific Northwest Environmental Research Lab., Corvallis, Oreg. M. H. Feldman

M. H. Feldman. Available from NTIS, Springfield, Va 22161 as PB-227 278 Price \$4.50 Printed copy; \$2.25 microfiche. Environmental Protection Agency Ecological Research Studies Report EPA 660/3-73-013, September 1973. 22 p, 1 fig. 6 tab, 13 ref.

*Oil pollution, *Oil spills, *Degradation(Decomposition), Descriptors: Weathering, Chemical degradation, Public health, *Path of pollutants, Sedimentation, Trace elements. Identifiers: *Photolysis.

Weathering of oil pollution on marine waters is discussed. Photolysis, interactions with trace materials, and sedimentation with particulate materials are effective and have possible ecological importance. Generation of carcinogenics from

close molecular precursors is considered probable. (Knapp-USGS) W74-12084

INTERFACILA SHEAR STRESS IN DENSITY WEDGES, Canada Centre for Inland Waters, Burlington

(Ontario). For primary bibliographic entry see Field 8B. W74-12096

CIRCULAR TURBULENT JET IN AN OPPOS-

ING INFINITE STREAM, Alberta Univ., Edmonton. Dept. of Civil Engineer-

S. Beltaos, and N. Rajaratnam.

In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publi-cation No 4, p 220-237, 1973. 8 fig, 1 tab, 11 ref.

Descriptors: *Jets, *Mixing, *Dispersion, *Waste dilution, Path of pollutants, Waste disposal, Waste water disposal.

Identifiers: Counterflow jets.

Jets in counterflow spread rapidly and can be used to obtain rapid dilution of effluent discharges. The propagation of a turbulent round jet in an infinite opposing stream was studied utilizing data available in literature and new experimental data. It is possible to predict the flow field in a simple manner, using a semiempirical approach. Prelimi-nary comparisons show that a jet issuing against a stream is an efficient means for obtaining rapid dilution of effluent discharges. (See also W74-12087) (Knapp-USGS) W74-12097

LATERAL MIXING CHARACTERISTICS OF THE HYDRAULIC JUMP IN A SPATIALLY-VARIED FLOW

Ottawa Univ. (Ontario). Dept. of Civil Engineer-

ing. R. Townsend, and D. L. Egar.

In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publi-cation No 4, p 238-256, 1973. 13 fig, 5 ref.

Descriptors: *Mixing, *Hydraulic jump, *Heated water. Waste water disposal, Thermal pollution. Open channel flow, Water pollution sources

Hydraulic jump can be used to effect rapid lateral mixing of a tempering flow introduced on one side of a model effluent discharge channel. The problem of predicting the location of jumps, with spatially varied upstream flows, was considered. Tests indicated that a jump could be used effectively to accelerate the mixing process, and that standard methods for the prediction of location are inadequate when the jump forms near the confluence of the two streams. (See also W74-12087) (Knapp-USGS) W74-12098

REAERATION IN OPEN-CHANNEL FLOW, Canada Centre for Inland Waters, Burlington (Ontario) For primary bibliographic entry see Field 5G. W74-12099

APPLICATION OF THE CONCEPT OF BIFUR-CATED PLUME TO SOME OIL POLLUTION PROBLEMS IN THE STRAIT OF GEORGIA, Alberta Univ., Edmonton. Inst. of Earth and Planetary Physics.

M. L. Khandekar, and T. S. Murty In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 273-286, 1973. 5 fig, 4 tab, 6 ref.

Descriptors: *Path of pollutants, *Oil spills, *Straitis, *Canada, *Stratified flow, Tides, Currents(Water).
Identifiers: *Strait of Georgia(Canada).

The effect of stratification on the spread of oil leaking from a grounded ship was determined for three different locations in the Strait of Georgia. The calculations were made for different crude oils and residues covering a range of densities and also covering a range of tidal and wind generated currents as well as different rates of oil leaks. (See also W74-12087) (Knapp-USGS) W74-12100

NUMERICAL MODEL STUDIES OF RIVERS AND ESTUARIES, National Research Council of Canada, Ottawa

(Ontario). Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-12101

FORECASTING POLLUTION IN RIVERS. ESTUARIES AND THE SEA,
Water Pollution Research Lab., Stevenage

(England).

. Hart, M. J. Barrett, and A. L. H. Gameson. C. Hart, M. J. Barrett, and A. L. H. Gameson.
 Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 129-180, 25-27 September, 1973. 17 fig. 4 tab. 23 equ. 26 ref.

pollution control, *Estuaries, Descriptors: *Water *Forecasting, *River systems, *Estuaries, *Oceans, *Computers, *Model studies, Sewage, Effluents, Simulation analysis, Coliforms, Data collections, Discharge(Water), Pollutants, Dissolved oxygen, Systems analysis.
Identifiers: Offshore areas, Trent River(England),

Inorganic nitrogen.

The Water Pollution Research Laboratory examines the effects produced by the discharge of polluting liquids into natural waters. Studying existing situations in sufficient detail facilitates forcasting pollution in other circumstances and other casting poliution in other circumstances and other systems. These effects are generally very complex and frequent use is made of computers to deal with the large number of interrelated factors and to expedite the numerical work. This paper illustrates the utilization of computers to tackle three separate problems of pollution forecasting: in rivers, estuaries, and the sea. In each case, details are given of the methods of data analysis. The first section shows how the examination of mass budgets in rivers and the determination of the sources of pollutants enable the construction of forecasting models for water quality. A model developed for predicting concentrations of inorganic nitrogen is described. In section 2, methods for predicting the effect of changes in quantity or quality of effluents in estuaries are reviewed: mixed-segment model; quantized mixing model; time-dependent models; and a two-dimensional steady-state model. Considered also is the calculation of distribution of dissolved oxygen. Section 3 tion of distribution of dissolved oxygen. Section 3 presents a simple simulation model of the processes occurring in the sea, accounting for the rate of addition of coliform bacteria, the initial dispersion, vertical mixing, topography, tidal movement, eddy diffusion, and coliform mortality. Input data are considered and the results examined. (Sec also W74-12107) (Bell-Cornell) W74-12116

COMPUTER APPLICATIONS IN WATER QUALITY MODELLING: PREDICTION OF AMMONIACAL NITROGEN IN THE RIVER THAMES, EASAMS, Camberley (England).

N. C. Oxley

Sources Of Pollution—Group 5B

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 71-74, 25-27 September 1973. I fig. 1 tab.

Descriptors: *Water quality control, *Computer models, *River systems, *Statistical models, *Monitoring, Effluents, Standards, Equations, data, Hydrologic Stochastic processes, Management, Reach(Streams), Catchments, Systems analysis.

*River Identifiers: Thames(England), *Ammoniacal nitrogen, Concentration, Sewage

Due to the current concern over the effects of increasing discharges of sewage effluent, a computer model has been developed to predict the concentration of Ammoniacal Nitrogen at defined points in the Thames River. High ammonia concentrations inhibit the disinfection of water for supply and raise the costs of chlorination. Water quality relationships have been developed from a statistical basis, using data routinely collected by the Thames Conservancy from 1967 through 1973. The situation for each discrete element, into which the River may be divided, is amenable to multiple regression analysis, the final concentration being the dependent variable. The whole complex system of inputs and abstractions is broken down into a series of rational systems, each amenable to computer analysis. Individual regression equations have been built into the final model to predict ammonia concentrations at 12 monitoring points in the main river. Statistical modelling recognizes the stochastic nature of those parameters affecting quality levels, while obviating the necessity for long-term research into causal interactive relationships. The short computer time required to generate a series of predictions of concentration, and the accuracy of the predictions, suggests that this may be a useful technique in water quality management. (See also W74-12107) (Bell-Cornell) W74-12139

ECOLOGICAL STUDY OF SALMONELLA IN WASTE WATER, STAGNANT WATER, RUNNING STREAMS AND DOMESTIC WELLS

OF ANJOU, (IN FRENCH),
Faculte de Medecine et Pharmacie, Angers
(France). Laboratoire de Bacteriologie. F. Parvery, J. P. Becaud, G. Chambreuil, and B. Carbonnelle.

Rev Epidemiol Med Soc Sante Publique, Vol 20. No 7, p 603-618, 1972. English summary.

Identifiers: *Ecological studies, *Salmonella, Salmonellosis, Stagnant water, Streams, Wastes, Water wells, *France(Anjou), Water pollution

In the framework of an ecological survey carried out on Salmonella in Anjou, France, 2372 samples were analyzed. Strains (109) of Salmonella were isolated. The great diversity of the serotypes found is underlined. When a sufficient number of these serotypes are isolated, they appear to be the same ones as those isolated in patients. The chronological and topographical concordance is also reported. The isolation of a serotype in water at a given season often procedes the finding of corresponding clinical cases. In another connection, the distribution of the cases of human salmonellosis, especially along rivers, is obvious. The climatologic factors eventually linked to the contamination of water by Salmonella were analyzed: temperature, rain, river, flow, etc. The water purification stations are helpless in the treatment of bacterial pollution. These stations sometimes even introduce pathogenic bacteria. Such stations could be the ideal way to control endemics, if a serious effort were made to ensure bacteriological purifi-cation.--Copyright 1973, Biological Abstracts, Inc. W74-12152

SANITARY AND HYDROBIOLOGICAL CHARACTERISTICS OF THE APSHERON CANAL, (IN RUSSIAN). SAMUR-For primary bibliographic entry see Field 2I. W74-12153

SPATIAL AND TIME CHANGES OF SOME EN. VIRONMENTAL FACTORS IN THE PELAGIAL OF MIKOLAJSKIE LAKE,

Polish Academy of Sciences, Warsaw. Inst. of Ecology.

For primary bibliographic entry see Field 2H. W74-12155

PHOTOIONIZATION OF PHENOLS WATER: EFFECTS OF LIGHT INTENSITY, OXYGEN, PH, AND TEMPERATURE, Hebrew Univ., Jerusalem (Israel), Dept. of Physi-

cal Chemistry.

J. Feitelson, E. Havon, and A. Treinin

J Am Chem Soc. Vol 95, No 4, p 1025-1029, 1973,

Identifiers: *Cresol, Ionization, Light intensity, Oxygen, *Phenols, *Photoionization, Temperature, *Tyrosine, Hydrogen ion concentration.

The effects of flash intensity, oxygen, pH, and temperature on the photoionization of p-cresol and tyrosine were investigated by measuring the yields of the phenoxyl radicals generated in aqueous solutions. Photoionization of the phenols and their anions in alkaline solution occur via biphotonic and monophotonic processes, respectively. The (phenoxyl) is proportional to I sup n, where n changes from 2 to 1 over a relatively narrow pH range. In air-saturated solutions of the phenols, the transient absorption spectra of the phenoxyl radicals are observed but their initial yields are somewhat lower and are proportional to approxi-mately I1.5. There is no distinct difference between the effects of 1 atm of air and 1 atm of O2. In alkaline solutions (pH approximately 12) the effect of oxygen is relatively small. On the other hand, the anions display much higher sensitivity toward temperature; in alkaline solutions the yield of photoionization is hardly affected over the same temperature range. These results are interpreted on the basis of a mechanism involving ionization of triplet excited-state molecules. In neutral solutions the triplets exist in their acidic form and their ionization is induced by light, whereas in alkaline solutions the basic forms of the triplets, which are shorter lived, undergo thermal ionization with higher activation energy. A possible explanation of the oxygen effect is the formation of longer lived triplet-oxygen complexes which are then photoionized. Under all conditions employed the lifetimes of the precursors of phenoxyl radicals and e sub aq appear to be short compared to the duration of the flash employed (approximately 10 microsec) .-- Copyright 1973, Biological Abstracts, Inc.

BACTERIA AND THE ASSESSMENT OF WATER QUALITY,

Academy of Natural Sciences of Philadelphia, Pa. Dept. of Limnology. For primary bibliographic entry see Field 5A.

W74-12179

STABILIZATION OXYGEN DEMAND,

Weston and Stack, Inc., Malvern, Pa. For primary bibliographic entry see Field 5A. W74-12188

USE OF ARTIFICIAL SUBSTRATE SAMPLERS TO ASSESS WATER POLLUTION, For primary bibliographic entry see Field 5A.

W74-12190

EFFECT OF TEMPERATURE AND OXYGEN PRESSURE ON CELLULOSE UTILIZATION BY THERMOPHILIC ORGANISMS.

Rhode Island Univ., Kingston. Dept. of Chemical Engineering, and Rhode Island Univ., Kingston. Dept. of Microbiology. For primary bibliographic entry see Field 5D. W74-12193

WORKBOOK OF THERMAL PLUME PREDIC-TION, VOLUME 2, SURFACE DISCHARGES, Pacific Northwest Environmental Research Lab.,

Corvallis, Oreg. M. A. Shirazi, and L. R. Davis. Copy Available from GPO Sup Doc as EP1.23/2:72-005b, \$4.15; microfiche from NTIS, Springfield, Va 22161 as PB-235 841, Sz.25, 441 pages. Environmental Protection Agency Technology Series Report EPA-R2-72-005b, May 1974, 430 p, 8 fig. 8 tab. 3 ref, 6 append. EPA Project 16130 FHH, Program Element 1BA032.

Descriptors: *Thermal Descriptors: Finermal politution, *Discharge(Water), Water quality, Water quality control, Water pollution, Water pollution control, Surface waters, *Forecasting. Identifiers: *Surface discharge, *Thermal plumes.

In a continuing effort to present current knowledge on heated plume prediction, nomo-grams are presented that describe the behavior of surface jets for a wide range of ambient and initial discharge conditions encountered in practice. An attempt is made to present the material in a con-cise manner and in a format that is clear and accessible to a nonspecialist user. Many fundamental derivations are retained for further reading in the appendix; these undoubtedly would be of use to the specialist researcher. The nomograms provide qualitative results describing the surface plume quantative results describing the surface plume trajectory, width, temperature, depth, surface area and time of travel along the plume centerline. The nomograms are not intended to be used as ex-clusive design tools for surface discharge problems for use in a precise prediction of any specific surface plume condition. The nomograms are generated predominately from an idealized ematical model of a plume. Some field and laboratory data have been used to adjust the performance of the model so that more realistic pre-dictions are obtained. However, the class of problems that can be handled this way are limited due to the limitations in the model itself. The main restrictions included in the model are described both in a special chapter and in example problems. (See also W74-05111) (EPA) W74-12212

FIRST ANNUAL REPORTS OF THE EPA IFYGL PROJECTS.

National Environmental Research Center, Grosse Ile. Mich. Grosse Ile Lab. For primary bibliographic entry see Field 5C. W74-12214

NITROGEN AND PHOSPHORUS LOSSES FROM AGRONOMY PLOTS IN NORTH ALABAMA, Alabama A

Alabama A and M Univ., Normal. R. R. Bradford.

Copy available from GPO Sup Doc as EP1.23:660/2-74-033, \$0.90; microfiche from NTIS

Ber1.23.000/274-033, 30.90, interointer from NT is as PB-235 931. Environmental Protection Agency Technology Series Report EPA-660/2-74-033. April 1974. 40 p. 9 fig. 15 tab, 14 ref. EPA Project 13020 DWH. 800401.

Descriptors: Water quality, Water pollution control, *Nitrogen, *Phosphorus, Seasonal, Fertilizers, Sediments, *Alabama, Silts, Loam, Nutrients, *Cooper, Ureas, Nitrates, Cotton, Corn(Field), Soybeans, Path of pollutants, Identifiers: *Nutrient loss reduction, *Decause silt. loam, Seasonal-Cropping-Fertilizer effects, Sediment loss interactions, Millet, Ammonium nitrate,

Group 5B-Sources Of Pollution

A study of nitrogen and phosphorus losses from Decatur silt loam soil was conducted over three cropping periods from 1969-1972. Experimental agronomy plots were seeded to cotton, corn, soybeans, and millet and compared with uncropped and unfertilized check plots. The effects of these crops on nitrogen losses--total nitrogen, nitrate-nitrogen, and ammonium-nitrogen (for 1971-1972 only) and phosphorus losses were evaluated. Average total rainfall and losses of sediment and runoff were also determined. Losses of total nitrogen and nitrate-nitrogen were generally posi-tively correlated with the amounts of rainfall, runoff, and sediment. Phosphorus losses were positively correlated with sediment losses. More than 95% of phosphorus losses were associated with sediment loss. The effect of crops on loss of all nutrients was considerably smaller than seasonal effects and sediment losses. The effect of two fertilizers, ammonium nitrate and sulfur-coated urea, upon nutrient losses showed no evidence of superiority for sulfur-coated urea in reducing the total nitrogen or nitrate-nitrogen losses. (EPA) W74-12221

STATE-OF-THE-ART: SAND AND GRAVEL IN-

DUSTRY, Robert S. Kerr Environmental Research Lab., Ada Okla

B. D. Newport, and J. E. Moyer.

Copy available from GPO Sup Doc EP1.23:660/2-74-066, \$0.85; microfiche from NTIS as PB-236 147 MF \$2.25. Environmental Protection Agency Technology Series Report EPA-660/2-74-066, June 1974. 40 p, 6 fig, 1 tab, 31 ref. EPA Project 21 AGG-02, Program Element 1BB040.

*Water pour...
*Sediment pollution *Discharge(Water), transport. *Degradation(Stream), *Sediment control, Stream erosion, Discharge(Sediment), Excavation, Ecology, Flocculation, Storm runoff, *Sands, *Gravel, Reviews

An overview is presented of the sand and gravel industry in the United States and its relationship to the environment. The fate and effects of sediment generated by this surface mining activity on the benthic, planktonic, and fish communities of waterways are discussed in detail. Problems of the sand and gravel industry, types of operations, status of current treatment technology, and legislation affecting the industry are reviewed. (EPA) W74-12224

LEVELS OF COBALT, CESIUM AND ZINC IN SOME MARINE ORGANISMS IN JAPAN, National Inst. of Radiological Sciences, Chiba (Japan). Div. of Environmental Health. For primary bibliographic entry see Field 5C. W74-12244

ACUTE TOXICITY AND ACCUMULATION OF PCB (KC 300) IN FRESHWATER FISH, (IN JAPANESE), Freshwater Fisheries Research Lab., Tokyo

(Japan).

For primary bibliographic entry see Field 5C. W74-12245

PARTICULATE AND SOLUBLE AGENTS AFFECTING THE RELATIONSHIP BETWEEN METAL TOXICITY AND ORGAN-ISM SURVIVAL IN THE CALANOID COPEPOD EUCHAETA JAPONICA, British Columbia Univ., Vancouver. Inst. of

Oceanography.

For primary bibliographic entry see Field 5C. W74-12250

COASTAL MARINE POLLUTION AND FISH, Fisheries Research Board of Canada, West Vancouver B.C. Pacific Environmental Inst. For primary bibliographic entry see Field 5C. W74-12252

AMMONIA EXCRETION BY ZOOPLANKTON AMMONIA EACKETION BY ZOUPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER, Univ. of Washington, Seattle. Dept. of Oceanog-For primary bibliographic entry see Field 5C. W74-12253

VARIATION OF COPPER, IRON, MANGANESE AND ZINC CONTENTS OF OYSTERS (CRASSOSTREA ANGULATA) AT DIFFERENT STAGES OF GONADAL DEVELOPMENT (VARIACIONES DEL CONTENIDO EN COBRE, HIERRO, MANGANESO Y CINC EN RELA-CION CON LA MADURACION SEXUAL DEL OSTION, CRASSOSTREA ANGULATA, DE LAS COSTAS DE CADIZ),

Instituto de Investigaciones Pesqueras, Cadiz (Spain)

For primary bibliographic entry see Field 5C. W74-12255

STUDIES ON COPPER, IRON, MANGANESE AND ZINC IN OYSTERS (CRASSOSTREA AN-GULATA) ON THE GULF OF CADIZ (ESTUDIOS DEL COBRE, HIERRO, MAN-GANESO Y CINC EN OSTIONES-CRASSOS-TREA ANGULATA-DEL GOLFO DE CADIZ), Instituto de Investigaciones Pesqueras, Cadiz

For primary bibliographic entry see Field 5C.

THE USE OF BIOASSAYS TO DETERMINE THE RATE OF DEACTIVATION OF PESTI-

Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab. For primary bibliographic entry see Field 5C. W74-12261

UPTAKE, METABOLISM AND DISCHARGE OF POLYCYCLIC AROMATIC HYDROCARBONS BY MARINE FISH, Scripps Institution of Oceanography, La Jolla,

For primary bibliographic entry see Field 5C. W74-12262

THE FISH POPULATIONS OF AN INDUSTRIAL RIVER IN SOUTH WALES, University of Wales Inst. of Science and Tech.,

Cardiff. Dept. of Applied Biology. For primary bibliographic entry see Field 5C. W74-12263

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRATION IN THE WESER ESTUARY AND THE GERMAN BIGHT, (DIE MIESMUSCHEL MYTILUS EDULIS ALS INDIKATOR FUR DIE BLEIKONZENTRATION IM WESERASTUAR UND IN DER DEUTSCHEN BUCHT),

Institut fuer Meeresforschung, Bremerhaven (West Germany).

J. Schulz-Baldes. Marine Biology, Vol 21, No 2, p 98-102, 1973. 4 fig. 1 tab, 16 ref.

Descriptors: *Mussels, *Bioindicators, *Lead, Mollusks, Heavy metals, Metals, Pollutants, Spectrophotometry, Analytical techniques, Size, Bioassay, Gradation, Absorption, Estuaries, Water pollution sources, Heavy metals, Metals, Animal physiology.

Identifiers: *Mytilus edulis, Concentration, Kidney, *Germany(W *Germany(German Bight). *Germany(Weser

Common mussels were collected at 13 stations of the Weser Estuary, and the German Bight in 3 size categories. Equal numbers of the 3 groups from each station were analyzed separately for lead concentration by flameless atomic-absorption spectrophotometry. The lead concentration of the soft parts decreases from 6.4 microgram/g dry weight 15 km northwest of Bremerhaven to 1.9 microgram/g at Helgoland. At the same station, the concentration in small mussels is higher than in larger mussels. The lead concentration is exceptionally high in the kidney, quite high in the in-testine (with the digestive glands) and in the ad-ductor muscle, and rather low in the foot, gills, and mantle with gonads. Laboratory experiments reveal that mussels directly reflect the actual lead concentration of their environment. The observed gradient in lead contents of M. edulis in the Weser Estuary can thus be explained by the dilution of the highly lead-polluted river water by the sea water of the German Bight. With this physiological property, M. edulis is, therefore, highly suitable as an indicator organism for lead, and possibly other heavy metal pollutants. (Katz) W74-12265

NITRATE AND NITRITE TOXICITY TO SAL-MONID FISHES.

Rhode Island Univ., Kingston. Marine Experiment Station. For primary bibliographic entry see Field 5C.

W74-12267

W74-12275

LEAD CONCENTRATION IN NATIVE TROUT. Montana State Univ., Bozeman, Dept. of Chemis-For primary bibliographic entry see Field 5C.

CHARACTERISTICS AND COMPARATIVE MAGNITUDE OF NON-POINT SOURCES. Cornell Univ., Ithaca, N.Y. Coll. of Agricultural

Engineering. R. C. Loehr. Journal Water Pollution Control Federation, Vol 46, No 8, p 1849-1872, August 1974. 2 fig, 17 tab,

Descriptors: *Water pollution sources, *Phosphates, *Nitrogen, *Drainage, Fallout, Farm wastes, Storm runoff, Urban runoff, Tile drainage, Seepage, Runoff, Surface runoff, Agricultural runoff, Small watersheds, Forests, Surface waters, Return flow, Water quality, Feed

Identifiers: *Non-point sources, Potential area vield rate.

Data from investigations reported in the literature of potential pollution sources were used in a comrison of the characteristics and relative magnitude of non-point sources discharged to surface waters. The comparisons were made in terms of concentration (mg/l) and potential area yield rate (kg/yr/ha). The non-point sources included precipitation, forest land runoff, range land runoff, cropland runoff, runoff from land receiving manure, cropland tile drainage, irrigation return flows, urban land runoff, manure seepage, and feedlot runoff. The feasibility of controlling the various non-point sources was discussed. Nonpoint sources of nitrogen and phosphorus were compared with point sources in a small number of watersheds. (Humphreys-ISWS) W74-12278

METAL DISTRIBUTION ALONG A PROFILE OF AN INTER-TIDAL AREA, Stockholm Univ. (Sweden). Geological Inst. R. O. Hallberg.

Sources Of Pollution-Group 5B

Estuarine and Coastal Marine Science, Vol 2, No 2. p 153-170, 1974. 8 fig, 6 tab, 43 ref.

Descriptors: *Metals, *On-site investigations, *Sediments, *Tidal marshes, *Path of pollutants, Evaluation, Geologic investigations, Coastal marshes, Sampling, Sediment distribution, Shallow water, Marine geology, Chemical analysis, Sodium, Potassium, Magnesium, Calcium, Iron, Cobalt, Nickel, Copper, Lead, Profiles. Identifiers: Silver, Netherlands(Ameland Island).

The sediment from an intertidal area was investigated with regard to the vertical and areal dis-tribution of the acid-soluble metals: Na, K, Mg, Ca, Fe, Co, Ni, Cu, Ag and Pb. In addition to the metals, granulometric properties, content of or-ganic matter, carbonate concentrations and Eh were measured. The metals were accumulated along the margins of the area and showed a high correlation with organic matter and the finest sediment fraction. The interstitial water was diluted with infiltratable rain water. The higher level of with initiatative rain water. The higher level of this water, of the marsh area compared with that of the tidal flat area, gives rise to an upward per-colation in the sediment of the tidal flat area. The metal interrelationships and concentrations were determined by processes in the uppermost oxidized layer and only to a minor extent by reducing processes in the lower hydrogen sulphide-rich layers. (Humphreys-ISWS)

THE EMISSION OF BIOGENIC HYDROGEN SULFIDE FROM AMAZONIAN FLOODPLAIN LAKES.

Instituto Nacional de Pesquisas da Amazonia, Manaus (Brazil)

W. L. F. Brinkmann, and U. De. M. Santos Tellus, Vol 26, No 1-2, p 261-267, 1974. 6 fig, 5 ref.

Descriptors: *Lakes, *Hydrogen sulfide, *On-site investigations, *Dissolved oxygen, Flood plains, Hypolimnion, Limnology, Sulfides, Oxygen, Water pollution, Sampling, Chemical analysis, Fronts(Atmospheric), Floods, Fallout, forests, Distribution patterns, Profiles.

Identifiers: *Amazon River, *Brazil(Lago do Castanho), Biogenic hydrogen sulfide, Cold front.

The emission of hydrogen sulfide from Amazonian floodplain lakes was detected mainly during the period of falling water of the Amazon river, which peaks out in September and October. Hydrogen sulfide was present even in some surface water samples (up to 0.40 mg at. H2S as S/1). A part of the emitted hydrogen sulfide was recycled on a re-gional or local scale by means of biospheric trap mechanisms and eventual rainout, sustaining the tight sulfur cycle of the Amazonian tropics. But a certain amount of the emitted hydrogen sulfide contributed to the atmospheric sulfur budget. Under cold front conditions, however, the emitted hydrogen sulfide was rapidly recycled into the tropical forest stands. (Humphreys-ISWS) W74-12284

ADSORPTION OF PHOSPHATE BY RIVER PARTICULATE MATTER, Illinois State Water Survey, Peoria. Water Quality

Section

Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 662-671, August 1974. 6 fig, 1 tab, 13 ref.

*Adsorption, *Phosphates, Water pollution sources, Isotherms, Montmorillonite, Bentonite, Laboratory tests,

Suspended solids, Illinois.
Identifiers: *Illinois River(III), *Spoon River(III),
Particulate water, Phosphate adsorption, Adsorption kinetics

Adsorption of orthophosphate on samples of par-ticulate matter taken from the Illinois and Spoon

Rivers was investigated under laboratory conditions. Adsorption equilibria were reached in four to six days. Average adsorption rates between 0.0239 and 0.0366 were found during equilibration periods. Adsorption isotherms were computer, both for constant and for varying amounts of par-ticulate matter in the two rivers. During investigation of the effects of pH on phosphate adsorption, the highest adsorptive capacities were found at natural pH values of 8.3-8.4. Reductions in pH dropped this capacity to a minimum at pH6. Some slight recovery of capacity was observed at pH5 and 4. Rates of adsorption were influenced by the equilibrium concentration of phosphate-P and were essentially the same for the Illinois and Spoon Rivers. However, based upon the quantity of phosphate-P adsorbed per unit weight of particulate matter present, the capacity of the Illinois was seven times that of the Spoon River. Adsorp-tion isotherms for both streams were essentially linear, suggesting a functional relation between unit adsorption and particulate matter content. A concurrent study of samples collected daily from the Illinois River failed to show a similar correla-tion of particulate matter and phosphate adsorption. (Harmeson-ISWS) W74-12288

THE ROLE OF OXYGEN IN NITROGEN LOSS

FROM FLOODED SOILS, Louisiana State Univ., Baton Rouge For primary bibliographic entry see Field 2G. W74-12290

DETERMINATION OF DISPERSION AND NON-LINEAR ADSORPTION PARAMETERS FOR FLOW IN POROUS MEDIA,

Purdue Univ., Lafayette, Ind. School of Chemical Engineering. For primary bibliographic entry see Field 2G.

W74-12299

EXPERIMENTAL EVALUATION OF CHEMI-CAL TRANSPORT IN WATER-SATURATED POROUS MEDIA: 1. NONSORBING MEDIA, Oregon State Univ., Corvallis. Dept. of Soil Science.; and Oregon State Univ., Corvallis. Dept. of Assignituse (Chemi For primary bibliographic entry see Field 2G. W74-12306

PERSISTENCE AND MOVEMENT OF DBCP IN THREE TYPES OF SOIL,

L. R. Hodges, and B. Lear. Soil Science, Vol 118, No 2, p 127-130, August 1974, 2 tab, 4 ref.

Descriptors: *Persistence. Movement, *Soil *Fumigants, *Injection, Irrigation water, Soil water, Gas chromatography, *Path of pollutants, Pollutant identification.

Identifiers: *Dibromochloropropane, Volatile chemicals, Sandy clay loam, Silt loam, Loamy

The rates of distribution of dibromochloropropane (DBCP) and its persistence in three types of soil were compared after application by injection and flood irrigation. Measurement of DBCP by gas chromatography showed that an injection DBCP at a depth of 20 cm resulted in higher concentrations and deeper penetration in sandy clay loam and silt loam than when it was applied to irrigation water. Application of the same amount to the soil surface in 15 cm of water showed DBCP is trapped near the surface in these soils. Persistence is longer in these two soils and in loamy sand after injection. The most rapid penetration after application in water occurred in loamy sand where the rate and depth of penetration were greater than those measured after injection. This study indicates that type of soil is one of the most important aspects in deciding what method to use for ap-plying DBCP. (Visocky-ISWS)

W74-12310

THE ABSORPTION OF LOW CONCENTRA-TIONS OF SULPHUR DIOXIDE INTO AQUE-OUS SOLUTIONS, Auckland Univ. (New Zealand). Dept. of Chemis-

P. Brimblecombe, and D. J. Spedding. Tellus, Vol 26, No 1-2, p 272-276, 1974. 4 fig, 2 tab, 11 ref

Descriptors: Sulfur, *Sulfur compounds, *Absorption, *Aqueous solutions, Analytical techniques, Radiochemical analysis, Physical properties, Chemical properties, Sorption, Equilibri-um, Solubility, Water vapor, Phase diagrams, Humidity, Water properties, Water pollution, Diffusion, Sulfates.

sion, Surfaces.
Identifiers: "Gas-phase diffusion, *Soultion phase diffusion, *Sulfur dioxide, Desorption, Beta-spectrometers, Liquid scintillation spectrometers, Oceanic absorption, Ionic strength.

The rate of deposition of gas-phase SO2 to a variety of aqueous solutions was measured. The deposition rate was unaffected by relative humidity. Some salts may cause a 3-fold decrease in deposition rate as the ionic strength changes from 0.1 M to 0.8 M. Solution pH has the greatest influence causing a change from gas-phase diffusion control to solution phase diffusion control of deposition between pH 4 and pH 2. Indirect evidence suggested that the catalysis of SO2 oxidation in solution by Mn (II) ions is slow with respect to SO2 diffusion into solution. The practi-cal implications of these results were discussed. (Henley-ISWS) W74-12311

WATER QUALITY AND POLLUTION-SOUTH FORK OF LONG ISLAND, NEW YORK, Wisconsin Univ., Oshkosh. Dept. of Geology.

W. Fetter, Jr.

Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p779-788, August 1974. 3 fig, 5 tab, 5 ref.

Descriptors: *Water pollution, *Saline water intru-sion, *Nitrates, Groundwater, Groundwater recharge, Water quality, *New York. Identifiers: *Long Island(NY), Magothy aquifer, Glacial aquifer, Cesspools, Agricultural fertilizers.

The South Fork of Long Island is an area totally dependent on ground water for domestic and municipal water supply. Groundwater is contained in two geohydrologic units; the Glacial aquifer and the Magothy aquifer. The study evaluated water quality in both these aquifers as well as in several lakes and ponds. Listed as the principal sources of groundwater contamination were saline water en-croachment, agricultural fertilizers, and the underground discharge of numerous cesspools. Less than ten percent of the population is served by sewers and sewage treatment. The nitrate content or 0.1 tomesuc wells was shown in a statistical tabulation. Some data on the presence of deter-gents and chlorides were given. Comparisons were made between ground and surface water quality. (Harmeson-ISWS) W74-12313 of 651 domestic wells was shown in a statistical

THE SOLUBILITY OF VERY LOW CONCENTRATIONS OF CARBON MONOXIDE IN AQUEOUS SOLUTION, Auckland Univ. (New Zealand). Dept. of Chemis-

R. W. Meadows, and D. J. Spedding. Tellus, Vol 26, No 1-2, p 143-150, 1974. 2 fig, 6 tab,

Descriptors: Carbon, *Oxides, *Aqueous solutions, *Solubility, Gases, Physical properties, Phase diagrams, Saturation, Pressure, Atmospheric pressure, Saline water, Sea water, Fresh water, Absorption.

Group 5B-Sources Of Pollution

Identifiers: *Carbon monoxide, Solubility coefficient, *Absorption coefficient, Partial pressure, Henry's law, Exchange constants, Boundary layer, Radiochemical technique, Desorption, Supersaturation, Gas phase, Marine water.

The solubility of carbon monixide in natural waters was determined when the partial pressure of carbon monoxide in the gas phase approaches atmospheric concentrations. For both pure water and seawater the solubilities were found to be more than eight times the values which have previously been observed with an atmosphere of pure carbon monoxide present. Carbon monoxide therefore does not obey Henry's law over the pressure range from approximately 0.00005 atmospheres to greater than one atmosphere. The exchange constant for the exchange of carbon monoxide across the boundary layer of aqueous solutions was also determined. Values for seawater range from 1.5 times 10 to the minus 7th power m/s under calm conditions to 1 times 0.000006 m/s under the most turbulent conditions studied. The data obtained was used to re-evaluate the existence and size of the proposed oceanic source of carbon monoxide. A value of 10 to the 11th power g of carbon monoxide was calculated for the amount of carbon monoxide produced annually by the world's oceans, and this represents only 0.05% of the estimated carbon monoxide produced by man, and less than 0.002% of the largest natural source of carbon monoxide, which is the atmospheric oxidation of methane. (Henley-ISWS) W74-12316

ON THE ABSORPTION OF SO2 IN OCEAN WATER.

Frankfurt Univ. (West Germany). Institut fuer Meteorologie und Geophysik. For primary bibliographic entry see Field 2K.

WATER CIRCULATION AND NUTRIENTS IN THE NORTH-WEST IRISH SEA, Liverpool Univ. (England). Dept. of Marine Biolo-

gy. For primary bibliographic entry see Field 2L. W74-12322

AUTO-QUAL MODELLING SYSTEM, Environmental Protection Agency, Annapolis, Md. Annapolis Field Office. R. L. Crim, and N. L. Lovelace.

Available from NTIS, Springfield, Va 22161 as PB-227 032, Price \$18.50 printed copy; \$2.25 microfiche. Technical Report 54, March 1973. 301

Descriptors: *Water quality, *Path of pollutants, *Mathematical models, *Computer programs, Dissolved oxygen, Simulation analysis, Streamflow, Oxygen demand.

Two mathematical models were designed to meet needs of Federal, State or local agencies for water quality planning. The models are designed specifically for water bodies in which widths are small relative to their length. Most freshwater streams and tidal tributaries to estuarine bays fit that description. These are waters whose net hydraulic circulation patterns are essentially undirectional. (Knapp-USGS) W74-12342

COASTAL - ESTUARINE AND NEARSHORE PROCESSES, AN ANNOTATED BIBLIOG-

Ocean Engineering Informaton Service, La Jolla, Calif.

For primary bibliographic entry see Field 2L. W74-12351

WATER RESOURCES PROTECTION MEA-SURES IN LAND DEVELOPMENT - A HAND-BOOK.

Delaware Univ., Newark. Water Resources Center. For primary bibliographic entry see Field 5G. W74-12352

EFFECTS OF CLEAR CUTTING ON WATER DISCHARGE AND NUTRIENT LOSS, BITTER-ROOT NATIONAL FOREST, MONTANA. Montana Univ., Missoula. Dept. of Geology

T. Bateridge.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 038, \$3.75 in paper copy, \$2.25 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report No 52, July, 1974. 68 p, 15 fig, 15 tab, 59 ref. OWRT A-071MONT(1). 14-31-0001-4026.

Descriptors: *Clear-cutting, *Water pollution sources, *Montana, Water yield improvement, Water quality, Water chemistry, Nutrients Streamflow, Discharge(Water), Roads, *Conductivity, *Ions, Path of pollutants.
Identifiers: *Bitterroot National Forest(Mont).

The effects of clearcutting and road-building on the hydrology and water-chemistry of three pairs of small watersheds in the Bitterroot National Forest in Western Montana were studied for one year (1973). The watersheds were all steep, 6,000 to 7,000 feet in elevation, and ranged from 103 to 866 acres in area. 1973 was an abnormally dry year. Streamflow discharge was monitored throughout the snowmelt runoff period on each watershed. Water samples were collected from which field measurements of electrical conductivity were made, and laboratory tests were made for five specifications, pH was measured in the field. For two of the three pairs of watersheds, streamflow throughout the season was greater on the clearcut basin. For the smallest pair the same trend was observed, but flow ceased after June 26th. Conductivity varied inversely with discharge, and in most cases was higher on the control (forested) watersheds. Concentrations of ions (nitrates, chlorides, divalent cations, sodium and potassium) were relatively low, but tended to increase as streamflow diminished, and were generally higher on clearcut watersheds. (Williams-Montana State) W74-12359

EFFECTS OF SUSPENDED SILT ON DIS-SOLVED PHOSPHORUS LEVEL IN THE GAL-LATIN RIVER, Montana State Univ., Bozeman. Dept. of Plant

and Soil Science. F I Adamsen

Available from the National Technical Informa-Syalobe Holm the National Technical Information Service, Springfield, Va 22161 as PB-236 048, \$4.00 in paper copy, \$2.25 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report No. 56, August 1974. 79 p. 10 fig. 13 tab. 61 ref. (M.S. Thesis). OWRT A-060 MONT(1). 14-31-0001-3826.

Descriptors: Water pollution sources, *Phosphorus, *Montana, *Suspended load, Dis-Descriptors: solved solids, Phosphates, Soil erosion, *Sediment transport, Calcium, *Path of pollutants, Carbonates, Sulfates. Identifiers: *Gallatin River(Mont).

A two-year study of suspended sediments in the Gallatin River of southwestern Montana and its tributaries reveals that the predominations in the water were Ca+2 and HC0-3. During May and June, the concentration of dissolved solids was lower than in other periods (attributed to increased runoff from melting snow). During these months concentrations of suspended solids and dissolved phosphorus and the phosphorus content of the sediments were highest (probably due to increased amounts of surface soil erosion). The East Gallatin River (a major tributary draining significant areas of irrigated farmland as well as serving as receptor for Bozeman's sewage effluent) was supersaturated in phosphorus with respect to hydroxyapatite, while sites on the main stem Gallatin above the East Gallatin were below saturation. Extraction of sediments with NaHCO3 showed sedi-ments from the East Gallatin to be higher in extractable phosphorus than upstream sites. Extraction of phorphorus from the sediments by fungus indicated that 20 to 70 percent of the phorphorus content of the sediments may be biologically available. (Williams-Montana State)

EVOLUTION OF ANOXIC CONDITIONS IN BLACK SEA DURING HOLOCENE, Woods Hole Oceanographic Institution, Mass.

W. G. Deuser.
In: The Black Sea--Geology, Chemistry, and in: The Black Sear-Geology, Chemistry, and Biology; Degens, E.T., and Ross, D.A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 133-136, 1974. 3 fig. 14 ref. NSF Grant GA-1659.

Descriptors: *Density stratification, *Dissolved oxygen, *Water circulation, Salinity, Hydrogen sulfide, Water chemistry, Sea water. Identifiers: *Black Sea, *Anoxic conditions.

The condition for oxygen depletion in the Black Sea was established 9,000 years ago, when signifi-cant influx of Mediterranean water through the Bosporous began to develop density stratification in the basin. If a logarithmically decreasing rate of oxygen consumption is assumed, a 'decay' constant for the oxygen reservoir can be calculated, corresponding to a half life of 1,800 years. With the aid of this constant and curves of the distribution of volume and area versus depth, the rise of the 02-H2S interface and the growth of the anoxic water in terms of occupied volume and bottom area can be calculated. In agreement with observations, the calculations show that anoxic conditions began in the deepest part of the basin about 7,300 years ago and that the interface has continued to rise slowly in the recent past. (Knapp-USGS) W74-12375

DISTRIBUTION OF SOME TRACE ELEMENTS IN BLACK SEA AND THEIR FLUX BETWEEN DISSOLVED AND PARTICULATE PHASES,

Woods Hole Oceanographic Institution, Mass. P. G. Brewer, and D. W. Spencer.

In: The Black Sea--Geology, Chemistry, and Biology; Degens, E.T., and Ross, D.A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 137-143, 1974, 12 fig. 3 tab, 16 ref. USAEC Contract AT (30-1)-4150 and NSF Grants GA-13574 and GA-1659.

Descriptors: *Water chemistry, *Density stratifi-Descriptors: "water chemistry, "Density stratuti-cation, "Sulfides, "Dissolved oxygen, "Trace ele-ments, Bottom sediments, Suspended load, Geochemistry, Advection. Identifiers: "Black Sea, "Pycnocline.

The trace-element geochemistry of the Black Sea is dominated by the strong pycnocline separating the oxygenated and reducing environments. Using values of the vertical advective velocity and vertical eddy-diffusion coefficient derived from a model, the flux of dissolved sulfide, manganese, iron, copper, and zinc through this interface was estimated. The calculated sulfide flux is smaller than estimates of sulfide production in the sediments by a factor of four, but is consistent with estimates of chemosynthesis, suggesting that a sulfide-removal mechanism must operate. From the manganese data, it was estimated that about 78 percent of the detrital load of rivers entering the Black Sea is deposited near the mouths of the rivers and only 22 percent is spread over the surface of the Black Sea. If the mean sinking rate is 1,000 m/year, the data on the distribution and elemental composition of particulate matter in the

W74-12493

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Black Sea are in agreement with estimates of river input. (KnappnUSGS) W74-12376

PHOSPHORUS IN BLACK SEA,

Fishery Board of Sweden, Gotenburg. Hydrographic Dept. S. H. Fonselius.

In: The Black-Sea-Geology, Chemistry, and Biology; Degens, E.T., and Ross, D.A., editors: American Association of Petroleum Geologists, Tulsa, Oklahoma, Memoir 20, p 144-150, 1974. 7 fig, 3 tab, 15 ref.

Descriptors: *Phosphorus, *Water chemistry, Dissolved oxygen, Density stratification, W balance, Nutrients, Water analysis, Sampling. Identifiers: *Black Sea.

The concentrations of inorganic phosphorus and total phosphorus in the Black Sea were measured during the cruise of the R/V Atlantis II. organic phosphorus was determined from the difference between total and inorganic phosphorus. Detailed studies were made of the distribution of phosphorus through the halocline and close to the bottom of the central deep-sea basin. By use of a model of the water balance of the Black Sea, a crude phosphorus balance model was constructed. About 6,7000 tons/year of phosphorus must be added to the Black Sea sediments in order for the phosphorus concentration to remain at a constant level. (Knapp-USGS) W74-12377

RELATION BETWEEN CHLORINITY AND CONDUCTOMETRIC SALINITY IN BLACK

SEA WATER, Kiel Univ. (West Germany). Institut fuer Meereskunde. For primary bibliographic entry see Field 2K. W74-12378

SOME CHARACTERISTICS OF CARBONATE SEDIMENTATION IN BLACK SEA,
Akademiya Nauk SSSR, Gelendzhik. Institut Oke-

For primary bibliographic entry see Field 2J.

MASS PHYSICAL PROPERTIES OF SOME WESTERN BLACK SEA SEDIMENTS,

National Oceanic and Atmospheric Administra-tion, Miami, Fla. Atlantic Oceanographic and Meteorological Lab

For primary bibliographic entry see Field 2J. W74-12385

GEOCHEMISTRY OF SEDIMENTS FROM ELEVEN BLACK SEA CORES, Durham Univ. (England). Dept. of Geochemistry. For primary bibliographic entry see Field 2J. W74-12387

INFLUENCE OF ORGANIC MATERIAL AND PROCESSES OF SULFIDE FORMATION ON DISTRIBUTION OF SOME TRACE ELEMENTS IN DEEP-WATER SEDIMENTS OF BLACK

SEA, Akademiya Nauk SSSR, Moscow. Institut Oke-

For primary bibliographic entry see Field 2K.

W74-12388

ORGANIC ANALYSES OF BLACK SEA CORES, California Univ., Berkeley. Space Sciences Lab. For primary bibliographic entry see Field 2J.

MOLYBDENUM REHAVIOR OF PROCESSES OF SEDIMENT FORMATION AND DIAGENESIS IN BLACK SEA,
Akademiya Nauk SSSR, Gelendzhik. Institut Oke-

For primary bibliographic entry see Field 2J. W74-12391

METHYLMERCURY COMPLEXES AQUATIC SYSTEMS.

Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab. R. G. Zepp, G. L. Baughman, N. L. Wolfe, and D.

Environmental Letters, Vol 6, No 2, p 117-127, 1974. 4 fig. 3 tab, 20 ref.

Descriptors: *Mercury, *Organic compounds, *Aquatic environment, Proteins, Amino acids, Sulfur compounds, Sorption, Water pollution Identifiers: *Methylmercury

Equilibrium calculations indicated that methylmurcuric ion is almost completely complexed under conditions that exist in fresh waters, and the sulfur bonded complexes are likely to be the predominant forms of methylmercury in fresh natural waters. Calculations are presented concerned with the extent and nature of such complexations. The following conclusions were derived: (1) methylmercury ion makes up only an extremely small fraction of the total dissolved methylmercury in the aquatic environment. Essentially all of the methylmercury exists as various complexes, whose nature strongly depends upon pH and the concentrations of the complexing species; (2) common chemical species such as orthophosphate, ammonia, phenolic groups, and protein amino groups have little effect upon complexation of methylmercury; (3) calculations indicate that methylmercury can be freed from sulfur-bonded complexes by strong acidification or addition of high concentrations of halide ions; (4) sulfur-bonded methylmercuric complexes are likely to be very important in the aquatic environment. Trace concentrations of reduced sulfur species or thiols are sufficient to quantitatively complex methylmercury even with much higher concentrations of other chemical species present. (Jernigan-Vanderhilt)

METALLIC POLLUTANTS MONITORED BY ATOMIC ABSORPTION.

For primary bibliographic entry see Field 5A. W74-12486

LOW-MOLECULAR-WEIGHT URINARY PROTEINS IN ITAI-ITAI DISEASE, Gunma Univ., Maebashi(Japan). Dept. of Hygiene.

For primary bibliographic entry see Field 5C. W74-12490

MERCURY POISONING TAKES ITS TOLL IN JAPANESE FISHERMEN AND FAMILIES, For primary bibliographic entry see Field 5C. W74-12491

CADMIUM IN THE ENVIRONMENT, II. Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene

L. Friberg, M. Piscator, G. Nordberg, and T. Kjellstrom.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-221 198, \$6.00 in paper copy; \$2.25 in microfiche. February, 1973. 147 p, 2 fig. 19 tab, 191 ref. 68-02-0342.

Descriptors: *Trace elements, *Cadmium, *Toxicity, Exposure, *Analytical techniques, Air pollution, Weathering, Metabolism, Absorption,

Public health, Human pathology, Epidemiology, Distribution. Identifiers: Dose-response, *Japan, *Itai-Itai dis-

An update of an earlier review this presentation focuses upon information essential to the understanding of the toxic action of cadmium and the relationship between exposure and effects on human beings and animals. Information is reviewed about the following aspects of cadmium: (1) analytical methods of measuring cadmium; (2) occurrence, possible routes of exposure and daily intake; (3) matabolism, including uptake and absorption, transport, distribution and excretion of cadmium in animals, and in normal and exposed human beings; (4) relationships among concentrations of cadmium in blood, urine and organs, and Metallothionein; (5) effects and dose-response relationships on bone, and liver, renal effects; (6) epidemiological investigations in cadmium-polluted areas of Japan including methodology and cadmium exposure and medical effects in individual areas; (7) the cause of the Itai-Itai disease. (Jernigan-Vanderbilt) W74-12492

BIOLOGICAL DIFFERENCES IN CADMIUM

AND ZINC TURNOVER, Oklahoma Univ., Oklahoma City. Dept. of Environmental Health. For primary bibliographic entry see Field 5C.

MATERNAL-FETAL TRANSFER OF ORGANIC AND INORGANIC MERCURY VIA PLACENTA

Vanderbilt University, Nashville, Tennessee. M. M. Mansour, N. C. Dyer, L. H. Hoffman, A. R. Schulert, and A. B. Brill. Environmental Research, Vol 6, No 4, p 479-484, December, 1973. 2 fig, 4 tab, 6 ref. NSF (GI-30015) USAEC(AT-(40-1)-2401).

Descriptors: Transfer, *Mercury, *Rodents, *Tracers, *Milk, Animal physiology, Organic compounds, Inorganic compounds, Laboratory tests, Laboratory animals, Testing procedures, Analytical techniques, Distribution, Path of pollu-Identifiers: *Methylmercury.

The maternal-fetal transfer or organic and inorganic mercury across the placenta and through mother's milk has been investigated in the rat. Organic mercury is more readily transferable across the placenta than inorganic mercury. However, both forms of mercury were transferred through milk with approximately the same efficiency. The mercury concentrations in the placenta and the infant hair are directly related to the infant's body burden of mercury. (Jernigan-Vanderbilt) W74-12495

DETERMINATION OF TRACE ELEMENTS IN COAL, FLY ASH, FUEL OIL, AND GASOLINEA PRELIMINARY COMPARISON OF SELECTED ANALYTICAL TECHNIQUES, National Environmental Research Center, Research Triangle Park, N.C. Quality Assurance and Environmental Monitoring Lab. For primary bibliographic entry see Field 5A. W74-12500 DETERMINATION OF TRACE ELEMENTS IN

DETERMINATION OF SOLUBLE CADMIUM, LEAD, SILVER, AND INDIUM IN RAINWATER AND STREAM WATER WITH THE USE OF FLAMELESS ATOMIC ABSORPTION, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A. W74-12501

Group 5B-Sources Of Pollution

RETENTION OF TWO MERCURIALS BY STRIPED MULLET, MUGIL CEPHALUS, National Marine Water Quality Lab., Johns Island, S.C.

D. P. Middaugh, and C. L. Rose. Water Research, Vol 8, No 3, p 173-177, March,

1974. 5 tab. 13 ref.

Descriptors: *Mercury, *Mullets, *Organic compounds, *Inorganic compounds, *Path of pollutants, Toxicity, Seawater, Laboratory tests, Laboratory animals, Testing procedures, Analytical techniques, Animal physiology.

The uptake and retention of phenyl mercuric nitrate (PMN) and mercuric chloride (HgCl2) were studied in Mugil cephalus, the common saltwater mullet. Fish were exposed to calculated doses of 10, 50, 100 and 500 parts per billion (ppb) mercury of each toxicant in seawater for three hours. Thereafter, they were held in tanks with flowing seawater for 216h. Fish were sacrificed at 72-h intervals during holding period to determine levels of mercury in gill, liver and muscle tissues. Higher mercury levels were found in mullet exposed to PMN than in those exposed to equivalent concentrations of HgCl2. No deaths occurred among mullet dosed with HgCl2 whereas 58 per cent of those exposed to the highest level of PMN died within 21h of exposure. Mercury levels detected in tis-sues appeared to be related to the toxicant used, dose levels, and time of sampling after exposure. (Jernigan-Vanderbilt) W74-12504

COMPARISON OF CADMIUM 115M RETEN-TION IN RATS FOLLOWING DIFFERENT ROUTES OF ADMINISTRATION,

National Water Quality Lab., Cincinnati, Ohio.

Newtown Fish Toxicology Lab. W. Moore, Jr., J. F. Stara, W. C. Crocker, M. Malanchuk, and R. Iltis.

Environmental Research, Vol 6, No 4, p 473-478, December, 1973. 1 fig, 1 tab, 11 ref.

Descriptors: *Cadmium, *Rodents, *Absorption, Assurptions, Assurption, Assur

Whole body retention studies of Cd 115m were carried out on rates following four different routes of administration: oral, inhalation, intraperitoneal, and intravenous. The retention curve for each route of administration was divided into two components. The first component reflected the initial rapid clearance of Cd 115m primarily by the gastrointestinal tract and the second component indicated the absorption and turnover of Cd 115m. Extrapolation of the second component to the intercept gave initial absorption values of 93%, 91%, 41% and 2.3% for intraperitoneal, intravenous, inhalation, and oral routes, respectively. Immediately after inhalation exposure, 9.7% of the total inhaled Cd was present in the lungs. The route of ad-ministration did not significantly influence the rate of elimination and biological half-life of the second component of the whole body retention curve. (Jernigan-Vanderbilt) W74-12505

CONTAMINATION OF URBAN

WOODY PLANTS, Yale Univ., New Haven, Conn. School of Forestry and Environmental Studies. W. H. Smith.

Environmental Science and Technology, Vol 7, No 7, p 631-636, July, 1973. 4 tab, 46 ref. RSA-71-

Descriptors: *Plant tissues, *Heavy metals, Connecticut, *Spectrophotometry, Distribution, Cities, Rural areas, Trace elements, Statistical analysis, *Path of pollutants, Pollutant identification, *Air pollution effects, *Lead.

Atomic Identifiers. absorption spectrophotometry

During the fall, 1970, leaf and twig tissue representing the growth of the previous growing season was collected from six woody plant species season was collected from six woody plant species throughout the city of New Haven. Sugar maple was also sampled from remote northern New Hampshire and Vermont. These tissues were analyzed for Al, Cd, Cr, Co, Cu, Fe, Pb, Mn, Ni, Na, Sn, Zn, and V by atomic absorption spectrophotometry. Co and Sn were not detected. V was present in only a few samples from two city species. All other metals were found in all New Haven woody plants and in the sugar manles from Haven woody plants and in the sugar maples from remote areas. Cd, Cu, and Mn were present in 'normal' amounts. Al, Cr, and Ni were present in slightly above' normal amounts. Fe. Pb. Na. and Zn were present in 'above normal' amounts. mean Pb concentrations exceeded most Pb concentrations determined for trees in areas with geologic Pb deposits or adjacent to primary highways. Washing and analysis with an electron microprobe failed to provide conclusive evidence with regard to the specific location of the Pb on or in the tissue sampled. (Rowe-Vanderbilt) W74-12506

MERCURY CONCENTRATION WATER, SEDIMENTS AND FAUNA OF AN AREA OF THE TYRRHENIAN COAST, Siena Univ. (Italy). Inst. of Comparative Anato-

A. Renzoni, E. Bacci, and L. Falciai.

Revue Internationale d'Oceanographie Medicale Vol 31-32, p 17-45, 1973. 6 fig, 8 tab, 43 ref.

Descriptors: *Mercury, *Water pollution sources, *Sediments, *Marine animals, Aquatic life, Distribution, Analytical techniques, *Spectroscopy, Sea water, Industrial wastes, Benthic fauna, Pollutant identification. Identifiers: *Italy(Tyrrhenian coast), Atomic ab-

sorption spectrometry

Mercury concentrations found in the bodies of 21 of the most common species of 4 Phyla off the Tuscan coast were studied by atomic absorption spectroscopy. The study was made in 1972-73 near the site where a chloralkali factory dumps wastes which contain mercury. Samples of water and sediments were also collected and tested for mercury concentrations. Findings were as follows: the presence of high concentrations of mercury in the water of a larger area than had been thought, reaching values as high as 204 ng/l in the most pol-luted station; evidence of a relationship between the mercury concentration and the size of the sediment granules; great differences in mercury con-tent between animals and different phyla, and, within the same phylum, between groups and spe cies: great variations in mercury concentration in different tissues of the same specimen, with consistently higher values in the visceral organs than in the muscles in all specimens of all studied species; an evident mercury accumulation in the white muscle of the small-scaled sea-scorpion; no evident mercury accumulation in the foot muscle of the limpet. (Rowe-Vanderbilt)

ZINC, COPPER, MANGANESE IN THE RAZOR CLAM, SILIQUA PATULA,

Oregon State Univ., Corvallis. Dept. of Oceanography J. D. Gile.

Available from the National Technical Informa Translater from the National Technical Information Service, Springfield, Va 22161 as RLO-2227-T12-34, \$3.00 in paper copy, \$2.25 in microfiche. M Sc Thesis, June, 1972, 52 p. 25 fig, 11 tab, 35 ref, append. (Report RLO-2227-T-12-34).

Descriptors: *Trace metals, *Clams, *Zinc, *Copper, *Manganese, Variability, Aquatic life, Analytical techniques, Spectroscopy, On-site data collections, Animal physiology, Animal metabolism, *Washington, *Oregon.

Identifiers: Siliqua patula.

Zinc, copper and manganese concentrations were measured by atomic absorption spectroscopy in Siliqua patula collected during May, 1970 through May, 1971. Individual clams were analyzed to determine the degree of variation among individuals. Statistical analysis proved the variation to be highly significant. Monthly composite samples of 18 clams were collected from three sites along the Washington-Oregon coast. The samples were analyzed to examine differences in concentration among two general groups of tissue, collec-tion sites and monthly concentrations within a site. Copper and manganese were consistently higher in portion B (gills, liver, digestive system and reproductive tissue) and zinc was generally higher in portion A (foot, neck, mantle, adductor muscle and reproductive tissue). Variation among the three sites appears to reflect only the high degree of variability among individuals. There appeared to be a general trend of increasing concentration in and Summer for all three elements. The increased concentration in Spring and Summer may be a response to increased requirements due to changes in metabolic rate brought about by increased growth and reproductive activity. Monthly variation also could be reflecting the variation among individuals. (Jernigan-Vanderbilt)

METALS COORDINATED BY LIGANDS NOR-MALLY FOUND IN NATURAL WATERS. Haile Sellassie I Univ., Addis Abba (Ethiopia).

I. R. Pittwell. Journal of Hydrology, Vol 21, No 3, p 301-304, March, 1974. 1 tab, 3 ref.

Descriptors: *Heavy metals, Rivers, *Carbonates, *Chlorides, *Fluorides, Solubility, Hydrogen ion concentration, Water pollution sources. Identifiers: *Ligands.

Water, carbonate, chloride and fluoride are the main ligands responsible for keeping metals in solution in natural waters. Metals are listed by ligands and the conditions under which they are likely to be kept in solution are presented. The question of specific organic ligands is dealt with very briefly. (Jernigan-Vanderbilt) W74-12512

HOW TO TROUBLESHOOT FOR COPPER LOSS IN WATER-COOLED GENERATORS, Florida Power Corp., St. Petersburg.

Power, Vol 117, p 53-55, June, 1973, 2 fig.

Descriptors: *Copper, *Leakage, *Powerplants, *Water cooling, Testing procedures, On-site tests, Inspection, Measurement, Industrial plants, *Florida, Thermal pollution. Identifiers: *Crystal River(Fla).

Copper loss from stators of generators at a power plant is monitored at the deionizer through which cooling water is routed, allowing simultaneous measurement of system copper concentration and dionizer performance. The three troubleshooting techniques used to study copper loss were: (1) plotting on annual graph paper the weekly copper test results along with other important values; (2) placing a manometer on the stator cooler vent system to monitor operation of the vent systems vacuum-break and pressure relief valves with hourly readings for 6 days; and (3) researching the possible corrosion reactions for copper. Parameters deemed important for weekly measurement besides copper were pH, water-system makeup, operating service pump, and resin material. Oxygen was believed to be a main contributor to copper loss in the stator cooler system. That conclusion was based on manometer readings taken on the water storage tank vent system. Based on the results of the troubleshooting techniques, it was proposed that the vent system pressure-relief

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and vacuum break valves have independent piping, with the vacuum break done through a waterseal tank. (Jernigan-Vanderbilt)

LEAD CONCENTRATIONS IN THE WOOLY SCULPIN CLINOCOTTUS ANALIS, COL-LECTED FROM TIDEPOOLS OF CALIFORNIA, California Univ., Los Angeles. Dept. of Biology. W. P. Alley, H. R. Brown, and L. Y. Kawasaki. California Department of Fish and Game, Fisheries Bulletin, Vol 60, No 1, p 50-51, January, 1974.

Descriptors: *Lead, Aquatic life, *Fish, *Tidal waters, Analytical techniques, Spectroscopy, Air pollution, *California, *Sculpins, *Path of pollu-

The lead concentration in the muscle tissue of the wooly sculpin, Clinocottus analis, was examined for 30 fishes collected in tidepools in Southern California. The average lead values of the sculpins taken at Pt. Fermin was 4.9 ppm while the average lead level of sculpins collected at the isthmus of Santa Catalina Island was 2.7 ppm. The average lead concentrations for sculpins removed from north of San Simeon was only 0.6 ppm. The geographical variations (4.9 ppm in one area, 2.7 in another and 0.6 in a third) in lead levels undoubtedly reflect the contamination of the intertidal zone by atmospheric lead pollution. The least contaminated region easily qualifies as a rural area in that it is removed from any major metropolitan area and has not major highways passing through it. The other two areas lie close enough to Los Angeles to receive some of its atmospheric pollution. This conclusion is supported by the fact that the lead concentrations of the tidepool fishes of the area farther away are about half as great as those nearest Los Angeles but more than four times greater than the rural area. (Jernigan-Vanderbilt) W74-12515

UNIVERSITY OF TORONTO STUDIES REVEAL TOXIC METALS IN SLUDGES USED

Water and Sewage Works, Vol 120, No 7, p 50-52, July, 1973. 3 tab.

Descriptors: *Cadmium, *Lead, *Sewage sludge, *Fertilizers, *Toxicity, Public health, Laboratory tests, Analytical techniques, Spectroscopy, Heavy metals, *Canada, Soil contamination, Path of pollutants. Runoff.

Recent findings at the University of Toronto indicate alarming amounts of cadmium and lead present in sewage sludge used as fertilizers for food crops. These metals may be assimilated by crops in amounts harmful to human and animal health. Jon Van Loon, an analytical chemist and professor of geology and chemistry at the university, has been examining the metallic contents of sewage sludges from treatment plants in Toronto and surrounding Ontario provinces. Van Loon and his associates examined plant life that has been grown on fields, with and without the addition of sludges. They were especially interested in cadmium and lead. Samples (measured by atomic absorption spectroscopy) were taken from three plants representing vastly different sewage influents: sewage from heavy industry region showed heavy metal values for all the elements studied; metals were low in the sewage from the residential community; high chromium content was found in the third region which contained industries which made extensive use of chrome. Van Loon sees the ground water runoff threat to water supplies as a potentially great one, in view of the fact that metals contents in fields will increase over the years. (Jernigan-Vanderbilt) W74-12516 COMPARTMENTAL ANALYSIS FOR THE EVALUATION OF BIOLOGICAL HALF-LIVES OF CADMIUM AND MERCURY IN MOUSE OR-

Tokyo Univ. (Japan). School of Health Sciences. J. Matsubara-Khan. Environmental Research, Vol 7, No 1, p 54-67,

February, 1974. 5 fig, 3 tab, 32 ref.

Descriptors: *Cadmium, *Mercury, *Rodents, Distribution, *Mathematical models, Biology, Analytical techniques, Laboratory tests, Inorganic compounds, *Radioisotopes.

Repeated observations on the quantitative behavior of Cd109 and Hg203 in various mouse organs after a single injection of these tracers revealed that a clear difference of turnover characteristics exists between these nuclides, as was quantitatively determined by the compartmental analysis using electronic computer HITAC 5020. Loss patterns of Cd109 in liver, kidney, and salivary gland fitted the two-compartment model. In each organ fast and slow biological half-lives were obtained from the two observed rate constants. Data from gastrointestinal tissues or contents conformed with the one-compartment model. Loss patterns of Hg203 in most mouse organs, except brain, fitted the one-compartment model larger rate constants which were more than 10-fold those of Cd109. By comparing the parameters obtained in the fitted exponential functions for various organs, it was possible to define the interrelationship of the metabolic flow of the elements in the different organs. In the cadmium study data from kidneys, livers, and salivary glands of subcutaneously injected animals were obtained which gave a common value for the parameter reflecting the pool size. Rate constants in kidneys and salivary glands were very small thus giving extremely long biological half-lives. Decay pattern of Cd109 for the whole body was also examined in detail. (Jernigan-Vanderbilt) W74-12520

A METHOD TO MONITOR THE EFFECTS OF TOXICANTS UPON BREATHING RATE OF LARGEMOUTH BASS (MICROPTERUS SAL-MOIDES LACEPEDE), National Inst. for Water Research, Pretoria,

(South Africa); and Council for Scientific and Industrial Research, Pretoria (South Africa). For primary bibliographic entry see Field 5C. W74-12522

UNRECORDED POLLUTION FROM URBAN RUNOFF.

Rutgers-The State Univ., New Brunswick, N. J., For primary bibliographic entry see Field 5G. W74-12523

WHAT EXPLORATION GEOLOGISTS SHOULD KNOW ABOUT POLLUTION,
Texas Univ., Austin. Center for Research in Water

Resources.

E. F. Gloyna E. F. Gloyna. In: Oil and Water--A Symposium, Bureau of Economic Geology, Texas University, Austin, Texas, January 29, 1965. p 25-32, (1965). 4 fig, 2

*Groundwater. Potable water. Descriptors: Descriptors: "Groundwater, Potable water, Economics, Public health, Water pollution, Pollution abatement, Wastes, Water pollution control, Water pollution effects, Water pollution treatment, Water quality, "Recycling, Effluents, Waste water(Pollution), Waste water disposal, Sewage disposal, Sewage bacteria, Bacteria, Coliforms, Conservation, Biochemical oxygen demand. Identifiers: Effluent quality, *Exploration geolo-

When measured in terms of weight, water is by far the greatest resource used by man. Use per capita in the United States is greater by a large factor than all other resource uses combined. The depen-dency of the Southwest upon production processes and the use of great quantities of water is especially important. From now on water needs can best be met by controlling pollution. resources management must permit and even direct repeated reuse of the same water. This water may be diluted with relatively pure water as it flows from city to city, from industry to indus-try, from surface streams to underground formations, from agricultural lands to streams, from wastewater treatment plants to recreational facilities. In essence, water, the vital raw material, must be available in sufficient quantity and usable quality for purposes of furthering the state's affluent society. (Campbell-NWWA)
W74-12548

SIMULATION OF THE DIFFUSION OF DIS-SOLVED SALTS IN AQUIFERS, California Univ., Los Angeles. School of En-gineering and Applied Science. J. A. Dracup, and W. J. Karplus.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 076; \$3.00 in paper copy, \$2.25 in microfiche. Completion Report, (February, 1974). 7 p, 15 ref, (California Water Resources Center Project UCAL-WRC-W-340). OWRT-B-150-CAL(14).

*Programming *Simulation analysis, Waste water treatment, Mathematical models, Model studies, *California, Wattenatical models, Model studies, California, *Diffusion, *Dissolved solids, Salts, Aquifers, Waste assimilative capacity, *Path of pollutants, Optimal development plans. Identifiers: Whittier Narrows(Calif), Santee Water

Reclamation Projects(Calif).

Digital simulation tools for the study of hydrologic surface water and groundwater systems have been developed. The partial differential equation language PDEL was expanded and extended to facilitate the treatment of these problem areas. PDEL is a higher-level language permitting a user untrained in computer programming to formulate and express his mathematical model in easy-tolearn formal statements. The PDEL translator then converts this program into P1/I for further manipulation and eventual execution. A mathematical model to optimize the assimilative waste capacity of unconfined aquifers was formulated. The aquifer is used conjunctively with surface water supply sources. The waste waters are introduced into the ground water aquifer system by either well injection or by basin spreading. The model was applied to a ground water basin using data from the Whittier Narrows and Santee Water Reclamation Projects. Optimal decisions are made regarding the capacity of the waste treatment plant, the unit processes of the treatment plant, and the volume of the dilution water. (Snyder-California, Davis) W74-12594

QUANTITY AND MOVEMENT OF NITRATES IN SOIL WATER IN TWO CONNEC-TICUT SOILS TREATED WITH HIGH AND LOW LEVELS OF INORGANIC NITROGEN FERTILIZER,
Connecticut Univ., Storrs, Inst. of Water

G. F. Griffin, and R. W. Wengel.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 072; \$3.00 in paper copy, \$2.25 in microfiche. Completion Report, 1974. 17 p. 2 fig. 6 tab. OWRT A-029-CONN(2). OWRR 14-31-0001-3807.

Descriptors: *Nitrates, *Soil water movement, Soil types, *Soil-water-plant relationships, Groundwater, *Fertilizers, Hardpan, Leaching, Sampling, *Path of pollutants, Corn(Field). Identifiers: *Fragipan soils, Non-fragipan soils, Nitrate movement, Nitrate accumulation, Inor-

Group 5B—Sources Of Pollution

ganic nitrogen fertilizer, Potential groundwater

The quantity and movement of soil water nitrates in both a fragipan and non-fragipan soil were stu-died on corn land with and without added nitrogen fertilization. Particular attention was directed to determining nitrate movement along the fragipan surface, which occurs at a depth of two feet in this soil. In the three years of study no lateral movement of nitrate was detected, but movement into the fragipan was shown. Soil water nitrates at-tributable to field fertilization prior to the start of this study were detected at depths of two and four feet in the fragipan soil and influenced the first year results. Corn, grown for silage, reduced soil nitrate levels by the end of the growing season to levels considered safe for drinking water. (deLara-Connecticut) W74-12595

OIL SPILLS: HOW SERIOUS A PROBLEM. Journal Water Pollution Control Federation, Vol 45, No 4, p 583-585, April, 1973. 3 p.

Descriptors: *Oil wastes, *Oily water, *Water pol-lution control, *Water pollution effects, *Water pollution sources, Oil, Chemical wastes, Ships, Water law, Water quality control, Water Quality Act, Gasoline, Pollutants, Legislation, Adminis-trative agencies, Project planning, Water policy, Project purposes, Adoption of practices, Administration, Oil pollution, Pollution treatment, Federal

The Conference on the Prevention and Control of Oil Spills contrasts the opposing views on the seri-ousness of the problem of oil spills. One side asserts that the danger of the spills has been grossly exaggerated. Environmentalists caution that over 80 percent of oil spilled at sea remains in the marine environment for an indefinite period even after cleanup efforts are complete. Most informa-tion about the adverse effects of oil spills is based on major reported pollution spill incidents. About 200,000 tons of oil are spilled a year from seagoing tankers. Most oil spill incidents are the result of groundings not collisions. Groundings accounted for three and one-half times more oil spilled than collisions. There is no clear correlation between tanker size and oil spill frequency. Because of its worldwide impact, the problem of tanker spills is receiving international attention. The United Na tions Maritime Safety Committee has drafted proposed preventive measures against spills. A national program for oil spill control will be launched and will include regulations setting requirements for spill reporting and contingency planning with penalties and liabilities set out for infringers of the regulations. (Kelly-Florida) W74-12621

APPLICATION OF ERTS-1 DATA TO THE PROTECTION AND MANAGEMENT OF NEW JERSEY'S COASTAL ENVIRONMENT, Earth Satellite Corp., Washington, D.C. For primary bibliographic entry see Field 2L.

GROUNDWATER POLLUTION IN THE VICINI-

TY OF TOLEDO BEND RESERVOIR, TEXAS, Geological Survey, Austin, Tex. E. T. Baker, Jr., and J. Rawson. Open-file report, March 1974. 54 p, 12 fig, 5 tab, 6

Descriptors: *Water pollution sources. Reservoirs, "Groundwater, "Septic tanks, 'Texas, Soil disposal fields, Coliforms, Bacteria, Water quality, Path of pollutants, "Louisiana. Identifiers: "Toledo Bend Reservoir(Tex-La).

Pollution of water in the Toledo Bend reservoir, Texas and Louisiana, by the infiltration of sewage effluent into the shallow groundwater and then into the reservoir was studied by determining the bacteriological and chemical quality of the shallow groundwater and the general direction of groundwater movement in the area bordering the Texas side of the reservoir. During the period from March 1972 to March 1973, at least 1 sample from 19 of the 22 test wells contained coliforms, and at least 1 sample from 16 wells contained more than 1,000 coliform colonies per 100 milliliters. At least sample from 8 of the 22 test wells contained fecal coliforms. Samples from 2 wells contained more than 100 fecal-coliform colonies per 100 milliliters. At least 1 sample from 12 of the 22 wells contained streptococci. Samples from six wells contained both streptococci and fecal coliforms. Most of the monitoring sites where fecal coliforms were detected in the groundwater are at commercial developments. The probable source of the pollution is effluent from the septic tanks. The low densities of fecal coliforms and streptococci in water from most of the wells indicate that the pollutants contributed to the shallow groundwater and thence to Toledo Bend Reservoir by effluent from the septic-tank systems are also low. However, if development in the reservoir area continues at a rapid pace and septic tanks are used for the disposal of wastes, the pollution level can be expected to increase rapidly in some areas. (Knapp-W74-12641

RELATION OF CLIMATE TO LEACHING OF SOLUTES AND POLLUTANTS THROUGH SOILS.

Wisconsin Univ., Madison. Dept. of Soil Science. C. B. Tanner, and W. R. Gardner. Available from NTIS, Springfield, Va. 22161 as COM-73-11225, Price \$4.25 printed copy, \$2.25 microfiche. Report to National Oceanic and At-

mospheric Administration, Environmental Data Service, June 5, 1973. 48 p, 12 fig, 12 tab, 26 ref. NOAA Grant NG-34-72.

Descriptors: *Leaching, *Path of pollutants, *Irrigation effects, *Nitrates, Soil water move-ment, Translocation, Climatology, Weather data, Evapotranspiration, *Climates.

For subhumid and semiarid regions a simple model of nitrate leaching was combined with an analysis of weather records to give a construction of annual nitrate peaks in deep soil profiles and the rate at which the nitrate moves to the water table. The model is applicable to humid as well as arid regions. However, the annual nitrate peaks are so widely spaced in humid regions and groundwater tables often are so close to the surface that soil coring would not be definitive. Therefore lysimeter data are required in humid regions. (Knapp-USGS) W74-12645

PHOTOSYNTHETIC REC AGRICULTURAL SOLID RECLAMATION LIQUID AGRICULTURAL WASTES, AND

California Univ., Berkeley. Sanitary Engineering For primary bibliographic entry see Field 5D. W74-12647 Research Lab.

ASSESSMENT OF BIODEGRADATION POTEN-THAL FOR CONTROLLING OIL SPILLS ON THE HIGH SEAS,
Oklahoma State Univ., Stillwater. Dept. of

Biochemistry.
For primary bibliographic entry see Field 5G. W74-12649

ARGILLIZATION BY DESCENDING ACID AT STEAMBOAT SPRINGS, NEVADA, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 2K.

HEALTH HAZARDS OF THE HUMAN EN-

VIRONMENT.
World Health Organization: Geneva, Switzerland, 1972. 387 p. Illus. Paper. Pr. \$11.00.

Descriptors: *Public health, Air pollution, Water pollution, *Diseases, Ecology, Soil contamination, Pesticides, Radiation, *Environment, Hazards. Identifiers: Carcinogens, Teratogens

A summary is presented of current knowledge of health hazards in the human environment. In part 1, environmental hazards are considered in relation to such environmental aspects as air, water, food, soil, land, home and place of work. Part 2, discusses specific chemical contaminants and physical hazards in the environment. Mutagens, carcinogens, teratogens and pesticides are included. The problems involved in interpreting laboratory tests are described. In part 3, the development of a world system of surveillance and monitoring of environmental factors affecting health is discussed. Environmental parameters, environmental radiation, communicable diseases, indices of nutritional status, congenital malformations, chromosome aberrations, biochemical profiles, adverse reactions to drugs, cancer, domestic and wild animals, and systems analysis and control are included. In part 4, measures for dealing with environmental health hazards are described. The development of general criteria and standards is important. The role of basic sanitation in solving many problems in the control of communicable diseases and some indications of the ways in which advanced technology could be used for controlling certain pollutants and nuisances are discussed. The book will interest environmentalists, ecologists and anyone interested in environmental problems.--Copyright 1973, Biological Abstracts, Inc. W74-12679

ENVIRONMENTAL POLLUTION RY FLUORING WITH RESPECT TO THE PROSPECTIVE ALUMINUM FACTORIES IN KYUSHU, JAPAN (IN JAPANESE), Kagoshima Univ. (Japan). Dept. of Chemistry.

For primary bibliographic entry see Field 5C. W74-12680

LEPTOSPIROSIS: AN EPIDEMIC IN CHIL-

for Disease Control, Atlanta, Ga. Epidemiology Program. For primary bibliographic entry see Field 5C. W74-12685

A STUDY OF BACTERIAL MIGRATION IN IR-RIGATED SOILS, (IN RUSSIAN), Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR). V. A. Emel'Yanov, O. V. Zdorik, N. I. Zerbin, and A. V. Pendin.

S-Kh Biol. Vol 8, No 4, p 607-610. Illus. 1973. English summary

Identifiers: Bacterial migration, Soils(Irrigated), *E. coli, *USSR(Hungry steppe), *Serozem soils, *Path of pollutants.

A method was divised to study bacterial migration, using Escherichia coli as the study organism. A serozem soil of the Hungry steppe (USSR) was studied.--Copyright 1974, Biological Abstracts, W74-12704

NUTRIENT ENRICHMENT OF NATURAL WATERS,

Soil Conservation Service, Washington, D.C. A. A. Klingebiel. Qual Plant Mater Veg. Vol 22, No 3/4, p 223-248.

Effects Of Pollution—Group 5C

Descriptors: *Natural streams, Water pollution, Soil moisture, Soil water, Moisture content, Soil water movement, Water loss, Runoff, Surface runoff, Frosion, *Nutrients, Maps. Identifiers: Soil maps.

Evidence is presented to show the numerous sources of nutrient enrichment of natural waters. Factors affecting soil and water losses and their relationship to water pollution are discussed. The value and use of soil maps in predicting potential areas of water pollution from runoff and erosion is discussed. Small scale maps of the world are used to show how soil maps can be interpreted and used.—Copyright 1974, Biological Abstracts, Inc. W74-12709

REASONS FOR CRITICISM OF THE SYSTEM

OF SAPROBIONTS,
Polskie Towarzystwo Przyrodnikow im Kopernika, Warsaw.

L. Turobovski. Kosmos (Warsaw). Vol 22, No 1, p 39-42. 1973. Identifiers: *Saprobionts, Rivers, Biocenoses, Water pollution.

River water pollution and the resulting unnatural changes in biocenoses of surface waters made it necessary to reconsider the system of saprobionts. A list of index organisms divided into saprophobes, saproxenies, saprophils and saprobionts has been worked out; but this list needs to be continually readjusted to increasing pollution.—Copyright 1974, Biological Abstracts,

Inc. W74-12711

LOSSES OF NITROGEN AND OTHER PLANT NUTRIENTS TO DRAINAGE FROM SOIL UNDER GRASS,

Grassland Research Inst., Hurley (England). E. A. Garwood, and K. C. Tyson. J Agric Sci. Vol 80, No 2, p 303-312, 1973.

Descriptors: *Transpiration, Lysimeters, Nitrates, Runoff, *Grasses, *Perennial ryegrass, Drainage, Leaching, *Nitrogen, Nutrients. Identifiers: Grass, Plant, Potential, Soil

Drainage lysimeters were used to estimate actual transpiration of a perennial ryegrass sward; this is transpiration of a perennial ryegrass sward; this is compared with the calculated values for potential transpiration. Losses to drainage of NO3-N under differing levels of application of N fertilizer were examined. When 250 kh N/ha were applied annually, losses of NO3-N were negligible; when 500 kg N/ha were applied, up to 142.9 kg N/ha were lost to drainage. Concentration of NO3-N in the leachate with an application of 250 kg N/ha was low (1-5 ppm); with 500 kg N/ha the concentration ranged 10-109 ppm. Losses of NO3-N were particularly severe during winter following a dry autority of the state o ticularly severe during winter following a dry au-tumn. When drainage occurred during the growing tunin. When uranage occurred during the growing season losses were minimal. Concentrations and quantities of K, Ca, Mg, Na, P, Cl and S (as sulfate) leached were also examined.—Copyright 1973, Biological Abstracts, Inc. W74-12723

SOIL MICROORGANISM METABOLISM IN SPRAY IRRIGATION, North Texas State Univ., Denton.

For primary bibliographic entry see Field 5D. W74-12725

LEISHMANIASIS IN BRAZIL: VI. OBSERVA-TIONS OF THE SEASONAL VARIATIONS OF LUTZOMYIA FLAVISCUTELLATA IN DIF-FERENT TYPES OF FOREST AND ITS RELA-TIONSHIP TO ENZOOTIC RODENT LEISH-MANIASIS (LEISHMANIA MEXICANA

MANIASIS (LEISHMANIA MEXICANA AMAZONENSIS), Instituto Evandro Chagas, Belem (Brazil). Well-come Parasitology Unit. For primary bibliographic entry see Field 2I.

W74-12734

LEISHMANIASIS IN BRAZIL: VII. FURTHER OBSERVATIONS ON THE FEEDING
HABITATS OF LUTZOMYIA FLAVISCUTELLATA (MANGABEIRA) WITH PARTICULAR REFERENCE TO ITS BITING HABITS AT DIF-FERENT HEIGHTS, Instituto Evandro Chagas, Belem (Brazil). Well-

come Parasitology Unit.
For primary bibliographic entry see Field 2I.

NITRATES, NITRITES; THEIR RELATIONSHIP TO ANIMALS, MAN: IV. FACTORS CAUSING A CONCENTRATION IN FODDER CROPS OF NITRATES, NITRITES: THEIR DEPENDENCE UPON ECOLOGICAL FACTORS; TIME OF STORAGE, (IN GERMAN), Legiting for the control of the control of

Institut fuer Immunobiologie, Berlin (East Ger-

many). H. Liebenow

Arch Tierernaehr. Vol 21, No 8/9, p 635-648. 1971. Illus. (English summary).

Identifiers: Beans, Beets, Cocksfoot, Crops, Ecological studies, Fodder, Grass, Maize, Meadow, *Nitrates, *Nitrites, Oats, Rye, Sun-flower, Time, Vetches.

Over the experimental period from 1962-1967 the content of nitrates in the dry matter of irrigated grasses averaged 1.2% while that of non-irrigated grasses averaged 0.8%. The average values obtained for each of the 6 yr varied between 0.6% and 1.7% in the case of irrigated grass and ranged from 0.2%-1.4% in the case of non-irrigated grass. In the years 1964-1965 when high concentrations of nitrates were observed the percentage content of nitrates in irrigated grass obtained from a number of irrigation plots was found to be as high as 5.4% that of non-irrigated grass 3.1%. Ten different species of fodder crops which were grown in the years 1965-1967 on the average contained from 0.09%-1.2% of nitrates if the crops were under irrigation and from 0.09%-0.89% if the crops were not irrigated. The largest stores of nitrates were found in oats, sun-flower and fodder beets; smaller concentrations were contained in ryegrass. cocksfoot and stalked meadow grass while the smallest amounts of nitrates were found in maize, lucerne, vetches and fodder beans. Nitrites were found sporadically; the content of nitrites varied between 0.09 mg% and 11.6 mg% in irrigated grass and between 19.4 mg% and 301 mg% in sunflower. The following factors increased the nitrate content: cold weather, storage in stacks, drying between 80C and 120C resulting in a 11-24% increase.--Copyright 1973, Biological Abstracts, Inc. W74-12741

5C. Effects Of Pollution

ENVIRONMENTAL IMPACT ANALYSIS: THE EXAMPLE OF THE PROPOSED TRANS-ALASKA PIPELINE, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 6G. W74-12011

ECOLOGY OF TOXIC METALS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-12024

DISTRIBUTION, BIOLOGICAL EFFECTS, AND MIGRATION OF RADIOACTIVE ISOTOPES. For primary bibliographic entry see Field 5B. W74-12038

EFFECTS OF RADIOACTIVE STRONTIUM ON MICROFLORA OF WATER AND

MINERALIZATION PROCESSES OF ORGANIC SUBSTANCES.

For primary bibliographic entry see Field 5D.

ACCUMULATION OF STRONTIUM-90 IN YOUNG CARP, For primary bibliographic entry see Field 5B.

W74-12042

DISTRIBUTION, ELIMINATION, AND COEFFI-CIENTS OF ACCUMULATION OF STRONTI-UM-90, CESIUM-137, AND PHOSPHORUS-32 IN FISH,

For primary bibliographic entry see Field 5B. W74-12043

A SURVEY OF UNIQUE TECHNICAL FEATURES OF THE FLOATING NUCLEAR POWER PLANT CONCEPT.

Directorate of Licensing (AEC), Washington,

Available from NTIS, Springfield, Va 22161 as Rept No WASH-1304; \$5.45/copy, \$2.25/microfiche. Report No WASH-1304, March 1974. 111 p, 2 fig, 4 tab, 13 ref.

Descriptors: *Nuclear powerplants, Floating, *Oceans, *Sites, *Safety, Evaluation, *Surveys, Offshore platforms, Environmental effects, Accidents, Hazards, Transportation. Identifiers: *Floating nuclear powerplants.

The manufacture, installation, operation, and decommissioning of floating nuclear power plants at offshore sites are examined with respect to the major technical differences between such plants and land-based nuclear power plants. Anticipated environmental effects of activities associated with offshore nuclear plants are discussed. Possible ac-cidents, both inplant and during the transport of radioactive materials to and from an offshore plant, are described and an initial estimate of their relative significance presented. (Houser-ORNL) W74-12045

TEMPERATURE EFFECTS ON THE SORPTION OF RADIONUCLIDES BY AQUATIC ORGAN-ISMS.

Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab. R. S. Harvey.

Available from NTIS, Springfield, Va 22161 as DP-MS-73-8; \$4/copy, \$2.25/microfiche. Report No DP-MS-73-8, (May 1973). 20 p, 7 fig, 4 tab, 6

Descriptors: *Nuclear powerplants, *Effluents, Radioactivity, "Thermal pollution, "Thermal radiation, "Temperature, "Aquatic environment, "Environmental effects, Aquatic plants, Aquatic animals, Radioecology, Biota, Streams, Aquatic algae, Shrimp, Larvae, Sorption, Cesium, Stronti-

um, Zinc, *South Carolina. Identifiers: *Savannah River Plant(So Car).

The warm waters of the reactor effluent streams within the Savannah River Plant are sufficiently cooled to support diverse populations of aquatic organisms prior to their confluence with the river. Indigenous species of plants and animals are being studied in the laboratory to determine their role in the fate of radionuclides discharged to the fresh-water environment. The effects of water temperature changes on the growth of algae, midge larvae and freshwater shrimp, and their ability to sorb radioactive materials are reported. (Houser-ORNI.) W74-12048

RADIOACTIVITY AND HUMAN DIET. Pergamon Press, Oxford, Great Britain, 1966. R. S. Russell, editor. 552 p, \$15.00.

Group 5C-Effects Of Pollution

Descriptors: *Radioactivity, *Diets, *Foods, *Toxicity, *Food chains, Biology, Biological degradation, Biological treatment, Strontium, Cesium, Iodine, Air pollution, Fallout, Water pollution, Soil contamination, Path of pollutants, Transfer

When radioactive materials are deposited from the atmosphere so that both the land and water are contaminated, agricultural crops or animal produce are the principal sources of radioactivity in human diet; by comparison the contribution of fish and other foods produced in water is small. Thus the major emphasis in this book is given to the mechanisms by which radioactive materials enter man's diet after they have been deposited on growing plants or have entered the soil. These subjects are introduced in Part II, which describes the relevant aspects of soil chemistry and of the physiology of plants and animals. Subsequently, in Parts III and IV the behavior of individual nuclides in each step of the food chain is considered. The relative contributions of different foods to the total dietary intake under different circumstances are discussed, and when possible quantitative rela-tionships are suggested. The greatest attention is given to strontium-90, both because of the complexity of the factors which control its entry into diet and magnitude of the radiation doses which it may deliver. In Part V the general nature of food chains in fresh water and the sea are described. This information is relevant to assessing the effects of liquid radioactive effluent which discharged from nuclear establishments, but the types of situation which may then arise cannot be predicted in the detailed manner which is often possible when fission products are deposited on the surface of land. The local circumstances at the point where effluent is discharged may vary so widely that an independent evaluation may be necessary in each case. (See W74-12050-12051) (Houser-ORNL) W74-12049

FOOD CHAINS IN FRESH WATER,

Battelle-Pacific Northwest Lab., Richland, Wash. Biology Dept.

H. A. Kornberg, and J. J. Davis.

In: Radioactivity and Human Diet, p 385-418, 1966. 4 fig, 8 tab, 87 ref.

Descriptors: *Radioactivity, *Potable water. Aquatic environment, *Path of pollutants, *Adsorption, *Absorption, Transfer, *Ion exchange, *Food chains, *Diets, Toxicity, Human population, Water users, Public health, Surface waters. Aquatic life.

The introduction of radioactive materials into inland waters may create special problems due to the unique characteristics of aquatic environments. Because of rapid and selective adsorption and assimilation of radioactivity, surface waters containing levels of nuclides permissible for drinking purposes may support aquatic organisms containing concentrations of radionuclides that would not be tolerable for human consumption. However, no radiation effect on aquatic organisms resulting from radioactive materials present in natural bodies of fresh water has been demonstrated. It is usually assumed that if the water is safe for drink ing and producing food, no significant effects will accrue to biological communities living in it. The primary problems that arise when radionuclides are introduced into populated surface waters are those caused by their transfer among members of aquatic communities and eventually to man. Aquatic environments and the factors that affect them are discussed. The fate of radioactive substances in aquatic communities is outlined, and examples are cited of field surveys done where artificial nuclides have been introduced into natural bodies of water. (See also W74-12049) (Houser-ORNI.) W74-12050

FOOD CHAINS IN THE SEA,

International Lab. of Marine Radioactivity, Monte Carlo (Monaco).

W. A. Chipman. In: Radioactivity and Human Diet, p 419-453, 1966. 2 fig, 6 tab, 67 ref.

Descriptors: *Oceans, *Seas, *Sea water, *Radioactivity, *Food chains, *Toxicity, *Public health, *Human population, Water users, Diets, Marine life, Fish, Foods, Sorption, Adsorption, Absorption, Transfer, Ion exchange, Aquatic environment, Environmental effects, Radioactivity

The oceans and seas furnish sites for recreation, and are an important source of food, marine products for agriculture and industry, salts and minerals. The extensive sea fisheries of various nations give significant amounts of protein foods to the diet of man. Naturally occurring radioactive isotopes have always been present in the sea but the exploitation of atomic energy for military and peaceful uses has led to appreciable increases in its radioactivity. It has therefore become necessary to consider the effects of man-made radioactive substances both on marine organisms and on marine foods which man consumes. A description is presented of the oceans as an environment for marine life, the addition of radioactive materials to the sea from the use of atomic energy, uptake of radionuclides by organisms in the marine environment, and possible exposure of the population from radioactive contamination of fish and seafoods. (See also W74-12049) (Houser-ORNL) W74-12051

INDICATORS OF ORGANIC CONTAMINA-TION IN PLANTATION CANAL, BROWARD COUNTY, FLORIDA, 1971-72, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5B.

W74-12070

ECOLOGY OF THE EULITTORAL ZONE OF

LAKES, Warsaw Univ. (Poland). Zoological Inst. E. Pieczynska.

Ekol Pol. Vol 20, No 44, p 637-732, Illus, 1972. Identifiers: Allochthonous matter, Autochthonous production, Ecology, Environmental effects, Erosion, Lakes, *Littoral, *Poland(Masurian lakes), *Eulittoral zone.

Environmental conditions and biological processes in the eulittoral-intermediate zone between the lake and the surrounding land were analyzed. Investigations were carried out on 16 lakes (eutrophic, mesotrophic and dystrophic) of the Masurian Lakeland in northern Poland. The range of eulittoral, depending on the water level fluctuation and configuration of the shore terrace. is to a considerable extent modified by the erosion and accumulation processes. Allochthonous matter (of lake and terrestrial origin) and au-tochthonous production are the sources of organic matter in the eulittoral. The decomposition rate of this kind of matter was analyzed. The role of the eulittoral in the functioning of the lake system was discussed.--Copyright 1974, Biological Abstracts, W74-12151

EFFECT OF GRANULATED DDT USED IN MOSQUITO CONTROL ON WATER ORGAN-

ISMS, (IN RUSSIAN), Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).

M. G. Trofimova, and A. M. Mitrofanov. Med Parazitol Parazit Bolezn. Vol 41, No 5, p 620-

Med Parazitol Parazit Bolezh. 1986. 622, Illus, 1972. English summary. Andes-spp. *Chironomidae, Identifiers: Aedes-spp, *Chironomidae, Cladocera, Copepods, *DDT, Ecology, Environ-mental effects, *Mosquito control, Organisms, Water pollution effects, *Toxicity.

DDT (10% granulated) was used for control of larvae of mosquitoes of the genus Aedes. After aerial treatment of water reservoirs 100% death of larvae occurred in 24 h. Specimens for determination of DDT content in the water (surface and bottom layers), vegetation and soil were taken before and after treatment several times during I mo. According to chemical analyses, DDT was not found either in the superficial layer of water or in the water vegetation. The content of DDT in the bottom layer and silt varied from 0.001-0.007 mg/l and from 0.5-1.1 ml/kg, respectively. Observations of the population densities of hydrobionts in treated water reservoirs showed the organisms distributed in the thickness of water (Copepods and Cladocera) to be beyond the zone of toxic effect of granulated DDT, whereas the bottom Chironomidae died after introduction of the drug into the water reservoir .-- Copyright 1974, Biological Abstracts, Inc. W74-12154

SEASONAL AND ANNUAL PHYTOPLANKTON CHANGES IN CHIVYRKUISKII BAY, LAKE BAIKAL, (IN RUSSIAN),

Limnologicheskii Institut, Irkutsk (USSR).

G. I. Popovskaya.
Gidrobiol Zh. Vol 9, No 5, p 5-11, 1973. English summary.

Identifiers: *Algae, Annual, Biomass, *Diatoms, Lakes, *Phytoplankton, *Seasonal, *USSR(Lake Baikal), *Cyanophyta.

Data are presented on the species composition, seasonal and interannual dynamics of phytoplank-ton; 125 forms of algae were found. Their annual distribution is characterized by 3 maxima, spring and autumn being formed by diatoms, the summer one (the highest) by blue-green algae. The biomass oscillations from year to year are much smaller in the bay than in the Baikal (USSR) pelagic zone.--Copyright 1974, Biological Abstracts, Inc. W74-12160

DETRIMENTAL EFFECTS OF TOXICAL CHARGE BY HEAVY METALS OR PHENOL ON SUBMERGED MACROPHYTES (FONTINALIS ANTIPYRETICA L.), (IN GER-

Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie. S. Auerbach, P. Pruefer, and G. Weise.

S. Auerbach, P. Pruefer, and G. Weise. Int Rev Gesamten Hydrobiol. Vol 58, No 1, p 19-32, Illus, 1973. English summary. Identifiers: Cadmium, "Carbon dioxide exchange, Copper, "Fontinalis-antipyretica," "Heavy metals, "Macrophytes(Submerged), Mercury, "Phenols, *Macrophytes(Submerged), Mercury, *Phenols, Productivity, *Toxicity, Water pollution effects, Infrared analysis, Water moss.

The water moss F. antipyretica L. is well suited for measuring CO2 exchange by IR gas analysis (IRGA), as only CO2 is used for assimilation. Both in a state of full activity and of reduced activity in the course of a toxic charge the ratio of net primary productivity to respiration related to intermit-tent illumination is used as a bioassay. Three types regarding the proportion of net assimilation (AN) to respiration (RD) are referred to the toxic charge (phenol, HgCl2, CuSO4, CdCl2). In the case of displacing the balance of AN/RD in the diurnal cycle to the side of respiration, photosynthetic oxygenation in the water ecosystem decreases. The combination of measuring CO2 exchange by IRGA with a cyto-physiological investigation by determining the time of deplasmolysis of leaves is used for the prediction of vitality long before damage including lethal effects are recognized morphologically.--Copyright 1974, Biological Abstracts, Inc. W74-12165

MICROBIOLOGICAL OXIDATION HYDROGEN SULFIDE IN THE REPNOE LAKE (SLAVONIC LAKES), (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Mikrobiologii.

Effects Of Pollution—Group 5C

V. M. Gorlenko, E. N. Chebotarev, and V. I. Kachalkin.

Mikrobiologiya. Vol 42, No 4, p 723-728, Illus,

1973. English summary. Phaeovibrioides, Growth rate, "Hydrogen sulfide, Lakes, "Light intensity, Microbiological studies, "Oxidation, Photosynthesis, "Sulfur bacteria, "USSR(Repnoe Lake), sis, *Sulfur Phototrophic.

Oxidation of H2S in the water of the Repnoe lake. USSR, was mainly due to the activity of phototrophic sulfur bacteria. Chlorobium phaeovibrioides dominated (33.1,000,000 cells/ml). The maximal rate of the bacterial photosynthesis (160 microgram/C/I/day) was registered at a depth of 5.5 m at the boundary of the H2S zone. Low light intensity was the main factor limiting growth of the phototrophic sulfur bacteria.--Copyright 1974, Biological Abstracts, Inc. W74-12168

INFORMAL OPINIONS,

Food and Drug Administration, Washington, D.C. For primary bibliographic entry see Field 6E. W74-12173

BIOLOGICAL METHODS FOR THE ASSESS-MENT OF WATER QUALITY (SYMPOSIUM PRESENTED AT THE 75TH ANNUAL MEET-ING, AMERICAN SOCIETY FOR TESTING AND MATERIALS, LOS ANGELES, CALIF., 26-70, HINE 1072). 29 JUNE 1972).

American Society for Testing and Materials, Philadelphia, Pa. For primary bibliographic entry see Field 5A. W74-12174

THE ABC'S OF POLLUTANT BIOASSAY USING FISH,

Guelph Univ., (Ontario). Dept. of Zoology For primary bibliographic entry see Field 5A. W74-12176

USE OF ALGAE, ESPECIALLY DIATOMS, IN THE ASSESSMENT OF WATER QUALITY, Academy of Natural Sciences, Philadelphia, Pa. Dept. of Limnology. For primary bibliographic entry see Field 5A. W74-12180

USE OF AQUATIC INVERTEBRATES IN THE ASSESSMENT OF WATER QUALITY, Utah Univ., Salt Lake City. Dept. of Zoology For primary bibliographic entry see Field 5A. W74-12181

A TENTATIVE PROPOSAL FOR A RAPID IN-PLANT BIOLOGICAL MONITORING SYSTEM, Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies. For primary bibliographic entry see Field 5A. W74-12183

RAPID BIOLOGICAL MONITORING SYSTEM FOR DETERMINING AQUATIC COMMUNITY STRUCTURE IN RECEIVING SYSTEMS, Virginia Polytechnic Inst. and State Univ., Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5A.
W74-12184

ASSESSMENT OF FISH FLESH TAINTING

SUBSTANCES, Environmental Protection Agency, Grosse Ile, Mich. Grosse Ile Lab. For primary bibliographic entry see Field 5A.

W74-12186

USE OF HISTOLOGIC AND HISTOCHEMICAL ASSESSMENTS IN THE PROGNOSIS OF THE EFFECTS OF AQUATIC POLLUTANTS. Louisville Univ., Kentucky. School of Medicine. For primary bibliographic entry see Field 5A. W74-12187

MOBILE BIOASSAY LABORATORIES, Industrial Bio-Test Labs., Inc., Northbrook, Ill. For primary bibliographic entry see Field 5A.

THERMAL EFFECTS OF A NUCLEAR POWER PLANT ON THE MISSISSIPPI RIVER AT MON-TICELLO, MINNESOTA, Saint Cloud State Coll., Minn. Dept. of Biology.

A. J. Hopwood.

Available form the National Technical Informa-Available form the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 833, \$4.75 in paper copy, \$2.25 in microfiche. Min-nesota Water Resources Research Center, St. Paul, July 1974. Bulletin 19. 134 p, 53 fig, 30 tab, 23 ref. OWRT B-032-MINN(3). 14-31-0001-3097.

Descriptors: *Thermal pollution, *Lotic environment, *Fish populations, Benthos, *Minnesota, *Mississippi River, *Nuclear powerplant, Mayflies, Diptera, Invertebrates, *Aquatic insects, Water pollution effects. Identifiers: Monticello(Minn), Trichoptera.

The thermal effects of the nuclear power plant at Monticello, Minnesota were assessed by compar-ing postoperational (1971-1972) data to baseline data (1968-1971) on the Mississippi River. Macroinvertebrate samples from artificial substrates placed upstream were compared to those from the heated zone downstream. Trichopteran from the heated zone downstream. Trichopteran biomass increased, ephemeropterans and dipterans decreased in the heated zone. Significant responses to heated water were observed for Trichoptera in the July-October period, Ephemeroptera were most affected in the May-August period, Dipterans declined significantly during September through November. The number of species was not affected by the heat. Growth rates of macroinvertebrate groups in upstream and downstream areas were not significantly different in four of seven 35-day cycles observed. A comparison of the number of fish caught by electro-fishing along the oposite sides of the river showed that black crappies, smallmouth bass, and walleyes were more numerous on the heated side, and were often attracted to the discharge canal from adjacent areas of the river. Rough fish were generally indifferent to the heated water in most areas, but carp were more attracted by the discharge canal than other species. Normal movements of minnows and other population charac-teristics seemed unaffected by the temperature rise. Effects of the power plant upon other organisms, such as birds have been minor. (Walton-Minnesota) W74-12200

STUDIES ON THE EFFECTS OF SEWAGE EF-FLUENT ON SELECTED GROUPS OF ARTHROPODS AND PHYTOPATHIC NE-

Michigan State Univ., East Lansing. Dept. of Entomology.

Available from National Technical Information Service, Springfield, Va 22161 as PB-235 823, \$3.00 in paper copy; \$2.25 in microfiche. Completion Report (September 1974). 14 p, 5 tab, 5 ref. OWRT A-074-MICH(1), 14-31-0001-4022.

Descriptors: *Nematodes, *Sewage effluents, Cores, Water pollution effects, *Michigan, Mosquitoes, Irrigation, Water quality, *Insects. Identifiers: *Water quality management projects, Sewage effluent irrigation, Biting flies, Small mammals, *Arthropods, Seriological surveys, Haematrophagous insects, Phytopathic

Results are presented of a one year study conducted at the Michigan State University Water Quality Management Project in East Lansing, Michigan. The primary objective of the study was to obtain pre-operational baseline data that could be used as points of reference in planned studies to determine the long term effects of this sewage irrigation project on the maematophagous insects, soil microarthropods and phytopathic nematodes in the project site. This included specific efforts to identify the haematrophagous insects that were in-digenous to the project area, to assess their potential as human or animal pests and/or disease vectors, and to identify and categorize the soil micro-arthropods and phytopathic nematodes that now are present in the proposed irrigation plots and the areas adjacent to the water impoundments constructed for the project. W74-12202

EFFECTS OF CADMIUM SALTS ON THE REPRODUCTIVE POTENTIAL OF MALE RAINBOW TROUT AS DETERMINED BY IN-VIVO AND INVITRO TECHNIQUES, Oklahoma State Univ., Stillwater. Dept. of Zoolo-

For primary bibliographic entry see Field 5A. W74-12204

CULTURING AND ECOLOGY OF DIAPTOMUS CLAVIPES AND CYCLOPS VERNALIS, Univ. of Oklahoma, Norman. Dept. of Zoology. A. Robertson, C. W. Gehrs, B. D. Hardin, and G. W. Hunt.

Copy Available from GPO Sup Doc as EP1.23:660/3-74-006, \$2.55; microfiche from NTIS, Springfield, Va 22161 as PB-234 613, \$2.25. Environmental Protection Agency Ecological Research Series Report, EPA-660/3-74-006, April 1974. 226 p. 18 fig, 5 tab, 70 ref, 8 append. EPA Program Element IBA021, 18050 ELT.

Descriptors: *Copepods, *Water temperature, Aquatic populations, *Bioassay, Crustaceans, Animal ecology, Zooplankton, Food abundance, Laboratory animals, Environmental effects, Reproduction, *Temperature resistance, Thermal pollution, Water pollution effects.

polution, water polution effects.

Identifiers: *Diaptomus clavipes, *Cyclops vernalis, Laboratory culturing, Temperature relations, Food relations, Population dynamics, Life

Results are presented of studies undertaken to develop a method maintaining healthy self-propagating, laboratory cultures of the freshwater calanoid copeped, Diatomus clavipes. Recommendations are given as to container size, type of culture medium, light conditions, temperature conditions, food type and quantity, frequency of replacement medium, and amount of disturbance replacement medium, and amount of disturbance suggested for culturing. The results of a study dealing with effects of temperature on certain reproductive attributes of this species are presented. Temperature is shown to affect the longevity of the adult females as well as the size, carrying time, and probably total lifetime production of clutches. The results indicate that certain of the reproductive attributes of the females are affected by the temperature of early life as well as the acclimation temperature. Results are included of a study on the dynamics of a field population of D. study on the dynamics of a field population of D. clavipes. The durations of the various life history stages were estimated both from laboratory and field data. Life tables were constructed for the spring generation of this population as well as all generations in a reproductive year combined. The generations in a reproductive year combined. In estates of greatest relative mortality were identified. Recommendations are presented for culturing the cyclopoid copepod, Cyclops vernalis, and the results of studies concerning effects of temperature on certain reproductive attributes of this species are included. (EPA)

Group 5C-Effects Of Pollution

W74-12213

FIRST ANNUAL REPORTS OF THE EPA IFYGL PROJECTS.

National Environmental Research Center, Grosse He Mich Grosse He Lab.

He, Mich. Grosse He Lab. Avaliable from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 947. \$20.75 in paper copy; \$2.25 in microfiche. EPA Ecological Research Series No. 3, Report EPA-660/3-73-021, December 1973, 336 p. EPA Program Element 1B1026.

Descriptors: *Phytoplankton, *Nutrients, *Lake Ontario, *Zooplankton, Phosphorus, Mathematical models, Environment, Great Lakes, Data collections, Cladophora, *Eutrophication, Remote Sensing, Algae.

Identifiers: Genesee River(N.Y.), Near shore environment, *Hazardous materials.

The field data collection phase of an intensive multidisciplinary study of Lake Ontario was conducted in 1972-73 by agencies of the United States and Canada. The scientific program was designed to further the basic scientific knowledge of the Great Lakes, to provide the basis for improved water quality and quantity management, and to comprehend the broad impact of the lake on the environment of the Great Lakes Basin. The Chemistry-Biology Program had three major ob-jectives-material balance studies, evaluation of the current ecologic status of the lake, and the development of predictive mathematical models. The chemistry program was conducted at the Rochester Field Office of Region II. The biologically related studies were mainly performed through ten grants administered by the Grosse Ile Laboratory. This document brings together the annual reports prepared by the Grantees. It is hoped that distribution of these annual reports will provide for a more complete analysis of the data collected during International Field Year for the Great Lakes (IFYGL). (Thomas-EPA) W74-12214

DEVELOPMENT OF FIELD-APPLIED DDT. Envirogenics Systems Co., El Monte, Calif For primary bibliographic entry see Field 5G.

STATE-OF-THE-ART: SAND AND GRAVEL IN-

DUSTRY, Robert S. Kerr Environmental Research Lab.,

For primary bibliographic entry see Field 5B. W74-12224

PHYTOPLANKTON NUTRITION PHOTOSYNTHESIS IN LAKE MINNETONKA AND LAKES AT FAIRMONT, MINNESOTA, Minnesota Univ., Minneapolis. Dept. of Ecology

and Behavioral Biology. R. O. Megard.

Available from the National Technical Informa-Tion Service, as PB-235 906, \$3.75 in paper copy, \$2.25 in microfiche. Minnesota Water Resources Research Center, Univ. of Minn., \$1. Paul, Mimeographed Rept. 64 p, 29 fig, 16 tab, 27 ref. OWRT A-026-MINN(3).

Descriptors: *Phytoplankton, *Photosynthesis, *Lakes, *Minnesota, Dissolved solids, Chlorophyll, Phosphorus, Water pollution effects,

Water quality control.
Identifiers: *Lake Minnetonka(Minn), Lake pollution, Lake rehabilitation, Organic carbon.

Abundance of phytoplankton, rates of photosynthesis, concentrations of dissolved substances and other limnological features of Lake Minnetonka, near Minneapolis, and of five lakes near Fairmont, Minnesota, were studied. Lake Minnetonka is a large lake with many basins

located in suburban Minneapolis, whereas the lakes at Fairmont are in an agricultural watershed near the Minnesota-Iowa border. Fluctuations of population densities of phytoplankton in 4 basins of Lake Minnetonka were inferred from changes of concentrations of chlorophyll a and particulate organic carbon (POC) during the ice-free season. Concentrations of chlorophyll a during 1972 and 1973 were similar to those during 1968 and 1969 except in the lake's largest basin, where concentrations during 1972 and 1973 were only about 50% as high as during 1968 and 1969. The decrease of chlorophyll is attributable to the reduced influx of phosphorus, which decreased from about 13 metric tons/year because sewage effluents were diverted away from the basin during the winter of 1971-72. The decrease of chlorophyll coincided with lower concentrations of total phosphorus. Population densities of phytoplankton in the 5 lakes at Fairmont, in southern Minnesota are higher than in Lake Minnetonka. Concentrations of dissolved phosphorus must be reduced substantially before it begins to regulate algal abundance in the Fairmont Lakes. (Walton-Minnesota) W74-12227

DISTRIBUTION OF CYCLOPOIDA COPEPODITES IN THE RESTING STAGE IN BOTTOM SEDIMENTS OF ASTATIC RESER-

Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology. For primary bibliographic entry see Field 2H.

W74-12236

LEVELS OF COBALT, CESIUM AND ZINC IN SOME MARINE ORGANISMS IN JAPAN,

National Inst. of Radiological Sciences, Chiba (Japan). Div. of Environmental Health.

R. Ichikawa, and S. Ohno.
Bulletin of the Japanese Society of Scientific
Fisheries, Vol 40, No 5, p 501-508, May 1974. 2
tab, 13 ref.

Descriptors: *Bioassay, *Absorption, *Zinc, *Cobalt, *Cesium, *Marine fish, Metals, Path of pollutants, Food chains, Heavy metals, Industrial wastes, Neutron activation analysis, Analytical techniques, Methodology, Smelts, Shrimp, Mol-lusks, Water pollution effects. Identifiers: Flounder, Dolphin, *Japan.

Skine, muscle, viscera and bone of various species of marine fishes were analyzed by the neutron activation method to determine cobalt, cesium and zinc concentrations. Muscle contains much less cobalt and zinc than do the other tissues, whereas cesium is distributed rather uniformly in all of these tissues. The soft part of the short-necked clam showed much higher concentrations of the three elements than did fish muscle. Cobalt and zinc levels in shrimp (soft part and carapace), sea urchin (ovary) and see cucumber (whole body) are high than those in fish muscle, but the cesium level in these animals is somewhat lower than in any fish tissues. The concentration factors of cobalt, cesium and zinc were calculated for various tissues of animals by using the average concentration of the elements in sea water. Values of concentration factors for the animals analysed are in the range of 10 for cesium, 102 for cobalt and 103 for zinc, with some exceptions. (Katz)

ACUTE TOXICITY AND ACCUMULATION OF PCB (KC 300) IN FRESHWATER FISH, (IN JAPANESE), ...

Fisheries Research Lab., Tokyo Freshwater (Japan).

S. Kimura, H. Kumada, and Y. Matida. Bulletin of Freshwater Fisheries Research Laboratory, Vol 23, No 2, p 115-123, December 1973. 5 tab, 12 ref. English synopsis. Descriptors: *Polychlorinated biphenyls, *Absorption, *Carp, *Rainbow trout, Chlorinated hydrocarbon pesticides, *Posticides, *Toxicity, Bioassay Lethal limit, Food chains, Algae, Freshwater, Aquatic animals, Path of pollutants, Water ollution effects.

Identifiers: *TLm, Accumulation, Guppy, Gold-fish, Carassius ssp., Cyprinus carplo.

Acute toxicity of PCB to freshwater fish was evaluated, and preliminary experiments were conducted to estimate the accumulation of this compound by freshwater organisms. The PCB tested was KC 300 (trichlorinated form). The 96 hr TLm value of KC 300 for carp fry, guppy fry and adult female guppy were 1.45, 0.9 and 3.2 ppm, respec-tively. Goldfish and dace accumulated KC 300 directly from water and their concentration factors ranged from 2,000 to 3,000. The residue concentration in surviving female guppies exposed to the 96 hr TLm for 96 hours was 4,000 ppm (wet basis), and the concentration factor was above 1,000. Rainbow trout fingerlings were fed a mixture of fish food and feed oil containing KC 300 for 6 weeks and accumulated approximately 35% of the compound administered. The accumulation of KC 300 through a food chain was unclear and further studies are needed to confirm which pathway, whether through the food chain or directly from environmental water, contributes to the magnifica-tion of PCB by fish in natural water bodies. (Katz) W74-12245

MINERAL FERTILIZATION OF CARP PONDS IN POLYCULTURAL REARING,

Institut fuer Suswasserfischzucht, Plovdiv (Bulgaria).

Aquaculture, Vol 3, No 3, p 273-285, 1974. 3 tab, 2 fig. 18 ref.

Descriptors: *Aquiculture, *Fertilization, *Biomass, *Productivity, Carp, Fish farming, Fisheries, Productivity, Nitrogen compounds, Phosphorous compounds, Zooplankton, Benthos, Dissolved oxygen, Nutrient requirements, Environmental effects, Animal growth, Diptera, Oliscoheater, Constant Principles Oligochaetes, Copepods, Primary productivity, Food chains.

Identifiers: Superphosphate, Cladocera, Rota-

Polycultural carp growing using intenstive mineral fertilization (weekly and every 3 days) was examined. The greatest zooplankton and benthos biomass and the greatest fish growth per ha water area were obtained with 3-day mineral fertilization with ammonium nitrate, 708 kg/ha, and superphosphate, 395 kg/ha. The highest average season zooplankton biomass in mixed fertilization season zooplankton biomass in mixed fertilization (mineral and organic) is 2.437 g/m3. The highest average seasonal biomass of the benthos is established with three-day mineral fertilization, 1.472 g/m2. The total fish growth with three-day fertilization is 300 kg/ha higher than in the control ponds, without fertilization. The best fishery results have been achieved with three-day fertilization giving a total growth of the fish of 2,730 kg/ha and a food coefficient of 2.8. (Katz) W74-12246

DEAD POPULATIONS OF FISH IN THE RIVERS JORDAN AND ZARQA, Jordan Univ., Amman. Basic Medical Sciences. M. J. Haddadin, and A. A. Alawi. Biological Conservation, Vol 6, No 3, p 215-216,

1974. 1 fig.

Descriptors: *Analytical techniques, *Fishkill, *Pesticides, *Insecticides, Spectrophotometry, Toxicants, Carp. Organophosphorous, Poisons, Animal pathology, Water pollution effects, Pollutant identification. Identifiers: *Parathion, Gills, *Amman(River Jor-

dan), *Amman(River Zarqa).

Effects Of Pollution—Group 5C

Large numbers of dead fish in the Rivers Jordan and Zarqa in March 1973 suggested poisoning by insecticide. Spectrophotometry of extracts from fish gills and liver indicated that the probable was Parathion in a fine suspension. (Katz)

LONG-TERM CHANGES IN THE SETTLE-MENT OF BARNACLES IN THE MIAMI AREA, Rosenstiel School of Marine and Atmospheric

Rosenster Science, Miami, Fla. H. B. Moore, H. D. Albertson, and S. M. Miller. Bulletin of Marine Science, Vol 24, No 1, ; 86-100, 1974, 10 fig. 10 ref.

Descriptors: *Crustaceans, On-site investigations, *Florida, Environmental effects, *Temperature, *Sewage, Pollution, Water pollution effects, Hurcianes, Population, Invasion, Methodology, Discharge(Water), Seasonal, Oysters, Algae, Benthic fauna, Benthos.
Identifiers: *Barnacles,

*Settlement rates, Balanus ssp., *Miami Beach(Florida), Cypris.

Daily and monthly counts of barnacle settlement rates on test panels at Miami Beach are presented for the years 1943 to 1970. The effects of various environmental factors, such as water temperature, river discharge, sewage pollution, and hurricanes upon the barnacle populations of the test panel are also discussed. Changes in the species composi-tion due to the immigration of two species of barnacles new to the Miami area are also documented. In addition, barnacle settlement is considered in relation to populations of other fouling organisms found on the panels. (Katz)

THE EFFECTS OF ENVIRONMENTAL STRESS ON OUTBREAKS OF INFECTIOUS DISEASE

Eastern Fish Disease Lab. Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va.

S. F. Snieszko.

Journal of Fish Biology, Vol 6, No 2, p 197-208, 1974. 1 fig, 4 tab, 50 ref.

Descriptors: *Fish diseases, *Water pollution effects, *Stress, *Reviews, Diseases, Animal pathology, Environmental effects, Toxicants, Water chemistry, Aquatic environment, Infection, Temperature, Thermal stress, Thermal pollution, Oxygen, Dissolved oxygen, Supersaturation, Nitrogen, Eutrophication, Sewage, Biological Oxygen Demand, Metabolism, Industrial pollution, 2,4-D, Pesticides, Publications.

Identifiers: Metabolic wastes. Descriptors: *Fish diseases, *Water pollution ef-

Infectious diseases of fishes occur when suscepti-ble fishes are exposed to virulent pathogens under certain environmental stress conditions. Very little research has been carried out to show the effect of pollution on outbreaks of infectious diseases of fishes. Examples taken from the literature were selected and reviewed to show the coincidence of infectious diseases with stress caused by tempera-ture, eutrophication, sewage, metabolic products of fishes, industrial pollution and pesticides. (Katz) W74-12249

SOME PARTICULATE AND SOLUBLE AGENTS AFFECTING THE RELATIONSHIP BETWEEN METAL TOXICITY AND ORGAN ISM SURVIVAL IN THE CALANOID COPEPOD EUCHAETA JAPONICA, British Columbia Univ., Vancouver, Inst. of

Oceanography.
A. G. Lewis, P. H. Whitfield, and A. Ramnarine.
Marine Biology, Vol 17, No 3, p 215-221, 1972. 1
fig, 3 tab. 20 ref.

Descriptors: *Copepods, *Toxicity, *Chelation, *Resistance, Clay minerals, Sediments, Plankton, Metals, Diatoms, Sewage effluents, Trace metals, Methodology, Soils, Phytoplankton, Adsorption.

Identifiers: *Euchaeta japonica, Ascorbic acid, Humic acids, Particulates, Metal-binding capabili-

Particulate and water-soluble agents were tested to determine their ability to affect the relationship between metal toxicity and the survival of Euchaeta japonica (Copepoda, Calanoida). Clay minerals and diatoms were two types of particles capable of affecting this relationship. Ascorbic acid, sewage effluent, and water extracts of humic acid and two types of soils exhibited the same capability. The ability of the water-soluble agents was compared to that of a known chelating agent in an attempt to quantify the activity of the agents. (Katz) W74-12250

EFFECTS OF AERATION IN EARTHEN PONDS ON WATER QUALITY AND PRODUCTION OF

South Carolina Agricultural Experiment Station, Clemson.

H. A. Loyacano.

Aquaculture, Vol 3, No 3, p 261-271, 1974. 2 fig, 3 tab. 5 ref.

*Water quality, Descriptors: *Catfishes Aeration, Chemical oxygen demand, Water properties, Oxygen demand, Fish farming, Fish management, Methodology, Aquiculture, Dis-solved oxygen, Growth rates, Productivity, Water

Comparing effects of air volumes of zero, 6.9 and 10.4 m3/min per ha (0, 100 and 150 ft3/min per acre) indicated that greater volumes of air resulted in increased fish production. Increased volumes of air resulted in proportionate increases in dissolved oxygen content, allowing greater weights of foods to be offered to fish without depleting the oxygen content of the pond water. Chemical oxygen demand was inversely related to the volume of air delivered (Kotz) delivered. (Katz) W74-12251

COASTAL MARINE POLLUTION AND FISH, Fisheries Research Board of Canada, West Van-couver, B.C. Pacific Environmental Inst.

M. Waldichuk. Ocean Management, Vol 2, No 1, p 1-60, 1974. 7 tab. 110 ref.

Descriptors: *Marine fisheries, *Water pollution control, *Coasts, *Reviews, Fisheries, Water pollution sources, Water pollution effects, Industrial wastes, Domestic wastes, Sewage, Estuaries, Metals, Pesticides, Pollutants, Thermal pollution, Aquiculture, Water quality, Dissolved oxygen, Hydrogen ion concentration, Environmental effects, Ecosystems, Pulp wastes, Suspended solids, Food chains, Fruip waster, Suspensed solids, Food chains, Primary productivity, Toxici-ty, Shellfish, Biochemical oxygen demand, Oil, Radioactive wastes. Identifiers: "Sub-lethal effects, Bioaccumulation,

Artificial habitats.

Aquatic organisms are being threatened by a multitude of different types of pollutants, which impose a sub-lethal stress on the coastal marine ecosystem at all tropic levels. Reduction in diversity of species and population changes threaten the ecosystems. The economic effect of this pollution on world fisheries is considered and the importance of evaluating man's wastes and the possi-bilities of recycling these through the aquatic en-vironment for man's benefit are discussed. Topics vironment for man's benefit are discussed. Topics include: the use of domestic sewage for enriching the coastal waters for increased fish production; the use of cooling waters from thermal plants for enhancing growth of warm water species; using solid refuse to build artificial reefs for reef fish; and using artificial mudflats for intertidal shellfish culture. (Katz)

AMMONIA EXCRETION BY ZOOPLANKTON AND ITS SIGNIFICANCE TO PRIMARY PRODUCTIVITY DURING SUMMER, Univ. of Washington, Seattle. Dept. of Oceanog-

M. Jawed

Marine Biology, Vol 23, p 115-120, 1973. 2 fig, 2 tab. 23 ref.

Descriptors: *Ammonia, *Nitrification, *Primary productivity, *Cycling nutrients, Nitrogen compounds, Nitrogen, Zooplankton, Nitrogen cycle, Ammonification, Marine Plants, Marine animals, Nutrients, Withdrawl, *Columbia River, Gebands (1998) Methodology, Spectrophotometry, Jelly fish, Copepods, Nitrates, Stratification, Summer, Washington, Oregon.

Identifiers: *Excretion, Ammonia-N, Excretory

Excretion rates of ammonia have been determined for zooplankton off the coasts of Washington and Oregon. Rates varied from 0.16 to 0.60 microgramat NH4+ -N/ mg dry weight/day for most plank-tonic animals, and from 0.02 to 0.06 for jelly fishes. Ammonia concentration in sea water low in offshore regions. Ammonia released by zooplankton was studied in relation to primary productivity during summer. In the Columbia River plume offshore, excreted ammonia con-tributed about 90% of the total nitrogen requirements of observed production rates. The ammonia-N contribution was 36% in oceanic waters. and was relatively unimportant in the inshore region. The significance of eddy diffusivity in offshore waters and upwelling in inshore waters is also discussed. (Katz) W74-12253

OXYGEN CONSUMPTION IN RELATION OXYGEN CONSUMPTION IN RELATION
WITH SIZE AND TEMPERATURE IN
CRUSTACEA (CONSUMO DE OXIGENO EN
FUNCION DEL TOMANO Y LA TEMPERATURA EN CRUSTACEOS),
Instituto de Investigaciones Pesqueras, Vigo

(Spain). M. Alcaraz.

Investigacion Pesquera, Vol 38, No 2, p 289-304, April 1974. 6 fig, 4 tab.

Descriptors: *Temperature, *Oxygen, *Size, Crustaceans, Shellfish, Respiration, Oxygen de-mand, Mathematical models, Mass. Identifiers: *Prawns, *Decapoda, *Palaemonetes ssp., *Palaemon ssp., *Oxygen consumption, Arr-

henius equation.

Oxygen consumption was studied in three species of Crustacea Decapoda (Palaemonetes varians, Palaemon Serratus and Palaemon Elegans); in the last one the relationship between O2 consumption, net weight and temperature was also calculated. Equations were devised which allowed for a mathematical comparison of the apparent effects of weight, body surface and length of oxygen consumption. The same calculations were made at 15, 18 and 20 degrees C to determine the effect of temperature on the values for oxygen consumption. The Arrhenius law was used for calculation and values are reported. (Katz) W74-1225

VARIATION OF COPPER, IRON, MANGANESE VARIATION OF COPPER, IRON, MANGANESE
AND ZINC CONTENTS OF OYSTERS
(CRASSOSTREA ANGULATA) AT DIFFERENT
STAGES OF GONADAL DEVELOPMENT
(VARIACIONES DEL CONTENIDO EN COBRE,
HIERRO, MANGANESO Y CINC EN RELACION CON LA MADURACION SEXUAL DEL
CETTON. CLASSOSTREA ANGULA ET DEL LAS OSTION, CRASSOSTREA ANGULATA, DE LAS COSTAS DE CADIZ),

Instituto de Investigaciones Pesqueras, Cadiz (Spain).

(Spain). E. Pascual, and R. Establier. Investigacion Pesquera, Vol 38, No 2, p 387-395, April 1974. 3 tab, 1 fig, 6 ref.

Group 5C-Effects Of Pollution

Descriptors: *Oyster, *Zinc, *Iron, *Manganese, *Copper, *Gonads, *Sexual maturity, Heavy metals, Absorption, Metals, Benthic fauna, Mollusks, Shellfish, Reproduction, Immature growth stage, Spawning, Bioassay.

Identifiers: *Crassostrea angulata, *Ovaries, Accumulation, Ovocytes, Gills, *Spain(Cadiz).

Copper, iron, manganese and zinc contents in Crassostrea angulata was studied in both male and female gonads at different stages of development. Copper and zinc were not concentrated in gonads. Manganese was stored in ovaries and increases in concentration as the volume increases in females. The reverse is true with males. Accumulation of manganese occurs inside the ovocytes during the growth stage. After spawning, the total concentra-tion of manganese in oyster meat, mantle and gills is lower in females than in males. This suggests the possibility of manganese transference from dif-ferent organs to ovaries. (Katz) W74-12255

STUDIES ON COPPER, IRON, MANGANESE AND ZINC IN OYSTERS (CRASSOSTREA AN-GULATA) ON THE GULF OF CADIZ (ESTUDIOS DEL COBRE, HIERRO, MAN-GANESO Y CINC EN OSTIONES-CRASSOS-TREA ANGULATA-DEL GOLFO DE CADIZ), Instituto de Investigaciones Pesqueras, Cadiz

(Spain). R. Establier, and E. Pascual.

Investigacion Pesquera, Vol 38, No 2, p 371-384, April 1974. 3 tab, 7 fig, 10 ref.

Descriptors: *Oysters, *Zinc, *Iron, *Copper, *Manganese, *Toxicity, Heavy metals, Bioassay, Absorption, Path of pollutants, Laboratory tests Methodology, Analytical techniques, Seasonal, Mollusks, Shellfish.

Identifiers: *Crassostrea angulata, Kymograph, Accumulation, Shell movement, *Spain(Gulf of

Seasonal changes in copper, iron, manganese and zinc concentrations in oysters from two areas of SW Spain were studied. Relations between metal content and environmental conditions are unclear. A close correlation between copper and zinc is found. Variation in manganese content appears to be dependent on the sex and gonadal stage. Copper accumulation was shown by laboratory as-says, but similar assays with manganese were negative. Shell movements were followed with a kymograph to determine the toxicity of different concentrations of metals. The first alterations of shell movements occurred at concentrations of 0.03 and 0.06 ppm copper. Zinc toxicity was 40-50 times lower than that of copper. (Katz) W74-12256

EFFECTS OF THE POLYCHLORINATED BIPHENYL AROCHLOR 1254 ON THE AMERICAN OYSTER CRASSOSTREA VIRGINICA, Environmental Protection Agency, Gulf Breeze,

Fla. Gulf Breeze Lab. J. I. Lowe, P. R. Parrish, J. M. Patrick, Jr., and J.

Forester. Marine Biology, Vol 17, No 3, p 209-214, 1972. 4 fig, 1 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Growth rate, *Oysters, *Arochler, Laboratory tests, Ab sorption, Bioassay, Pesticides, Chlorinated hydrocarbon pesticides, Mortality, Pathology, Seawater, Animal physiology, Gas chromatog-raphy, Analytical techniques, Methodology, Retention, Microscopy, Cytological studies,

pollution effects.
Identifiers: *Accumulation, *Crassostrea virginica, Depuration, Pathogenesis, Histopathology.

Young oysters were continuously exposed to Arochlor 1254, a PCB, in flowing, unfiltered sea-water. Growth rate was significantly reduced in oysters exposed to 5 ppb for 24 weeks. Growth rate was not affected in oysters exposed to 1 ppb for 30 weeks. Mortality was not significant in exposed and control groups. In oysters exposed to 5 ppb, greatest PCB residue (whole body) was 425 mg/kg (ppm), 85,000 times the concentration in the water, and less than 0.3 ppm was retained after 28 weeks depuration in PCB-free water. In ovsters exposed to 1 ppb, greatest residue was 101 ppm, 101,000 times the concentration in the water and less than 0.2 ppm was retained after 12 weeks depuration. Examination of oysters exposed to 5 ppb of this PCB for pathogenesis atrophy of digestive diverticular epithelium and degeneration of vesicular connective tissues concomitant with leukocytic infiltration, but tissue recovery seemed excellent after 12 weeks depuration. (Katz) W74-12259

PRELIMINARY STUDY OF TEMPERATURE TOLERANCE IN JUVENILE HAWAIIAN MUL-LET (MUGIL CEPHALUS),

DET (MUGIL CEPHALUS),
Oceanic Inst., Waimanaol, Hawaii.
J. R. Sylvester, C. E. Nash, and C. E. Emberson.
The Progressive Fish Culturist, Vol 36, No 2, p 99-100, April 1974. 1 tab, 10 ref.

Descriptors: *Lethal limit, *Temperature, *Mullets, Marine fish, Freshwater, Sea water, Laboratory tests, Juvenile fish, Resistance, Heat resistance, *Thermal pollution. Identifiers: *Mugil cephalus, Temperature tolerance, Thermal shock, Zone of tolerance, Ac-

The upper and lower thermal limits necessary for the survival of juvenile Hawaiian mullet in freshwater and salt water were determined in laboratowater and sait water were determined in aboratory tests. After acclimation at 21 degrees C in freshwater the upper lethal level was between 27 degrees and 29.6 degrees C, the lower level between 10.2 degrees and 15.0 degrees C. In saltwater following acclimation at 26 degrees C, the upper level is between 29.0 and 33.0 degrees C, and the level was between 29.0 and 33.0 degrees C, and the lower level is between 10.4 and 14.0 degrees C. Results suggest that the zone of tolerance, as designated by upper and lower lethal levels, for juvenile mullet is greater in sea water. Other tests show that juvenile mullet are more resistant to the effects of low temperature than to high temperature. (Katz) W74-12260

THE USE OF BIOASSAYS TO DETERMINE THE RATE OF DEACTIVATION OF PESTI-

Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab. L. L. Marking, and C. R. Walker.

Bioassay Techniques and Environmental Chemistry, p 357-366, 1973. 3 tab, 3 fig, 5 ref.

Descriptors: *Bioassay, *Pesticides, *Toxicants, Resistance, Anamycin A, Laboratory tests, Hydrogen ion, Concentration, Rainbow trout, Sunfishes, Bullheads, Channel catfish, Methodology, Mortality, Lethal limits, Model studies.

Identifiers: *Biological half-life, LC50, Goldfish, Biological activity, Ictalurus punctatus.

The biological half-life of a pesticide can be established by determining the tolerance of fish or other organisms in bioassay of aged solutions containing unknown residual concentrations, and in concurrent reference tests containing known concentrations. The half-life of biological activity is calculated in two procedures by plotting the percent concentration remaining in aged solutions or the deactivation indices against aging time on cyclic semi-logarithmic graph paper. The half-life of biological activity of antimycin, a powerful fish toxicant, was determined for rainbow trout, goldfish, channel catfish, black bullhead, green-sunfish and bluegill. Antimycin was deactivated rapidly in high pH waters and the half-lives were as follows: pH 10=1.5 hours, pH 9.5=4.6 hours, pH 9.0=9.7 hours, pH 8.5=46 hours, pH 8=100 hours, pH 7.5=120 hours, and pH's 6.0 and 6.5=310 hours. (Katz)

UPTAKE, METABOLISM AND DISCHARGE OF POLYCYCLIC AROMATIC HYDROCARBONS BY MARINE FISH,

Scripps Institution of Oceanography, La Jolla,

R. F. Lee, R. Sauerheber, and G. H. Dobbs. Marine Biology, Vol 17, No 3, p 201-208, 1972. 9

Descriptors: *Organic compounds, *Metabolism, *Marine fish, *Aromatic compounds, Sculpins, Path of pollutant, Animal physiology, Biochemistry, Analytical techniques, Urine, Sea water, Abotion, Tracers, Chemical analysis, Lipids,

Identifiers: *Polycyclic aromatic hydrocarbons, *Naphthalene, 3-4-benzopyrene, Mudsucker, Sand dab, Gillichthys mirabilis, Oligocottus maculosus, Citharichthys stigmaeus, Gall bladder, Liver, Accumulation, Detoxification.

The uptake, metabolism and discharge of two polycyclic polycyclic aromatic hydrocarbons, 14C-naphthelene and 3H-3,4-benzopyrene, were studied in 3 species of marine fish (mudsucker, Gillichthys mirabilis; sculpin, Oligocottus maculosus; sand dab, Citharichthys stigmaeus). The path of hydrocarbons through the fish included entrance through the gills, metabolism by the liver, transfer of hydrocarbons and their metabolites to the bile, and, finally, excretion. The gall bladder was a major storage site of labeled hydrocarbons and their metabolites. The major product of 3H-3,4 benzopyrene metabolism was tentatively identified as 7,8-dihydro-7,8-dihydroxas 7,8-dihydro-1,0-The 14C-napthalene was to 1,2-dihydro-1,2-dihydrox-The urine apidentified ybenzopyrene. T ynaphthalene after 24 h exposure. The urine appeared to be the major avenue for discharge of labeled hydrocarbon from the body. Certain poly-cyclic aromatic hydrocarbons were rapidly taken up from seawater by the above fish, but detoxification mechanisms existed for efficient removal of these compounds from their body tissue. (Katz)
W74-12262

THE FISH POPULATIONS OF AN INDUSTRIAL

RIVER IN SOUTH WALES, University of Wales Inst. of Science and Tech.,

Oniversity of waters inst. of Science and Tech., Cardiff, Dept. of Applied Biology. R. Williams, and M. F. Harcup. Journal of Fish Biology, Vol 6, No 4, p 395-414, July 1974. 1 fig. 10 tab, 34 ref.

Descriptors: *Coal mine wastes, *Brown trout, Water pollution sources, Fish stocking, Industrial wastes, Urban runoff, Suspended solids, Suspended load, Trout, Spawning, Algae, Methodology, Growth rates, Minnows, Fish populations, Biomass.

Identifiers: *Steelworks wastes, *Recolonization, Roach, Chub, *United Kingdom(Wales-River Sir-

The River Sirhowy, a trout river in south-east Wales still subject to sporadically high levels of suspended solids derived from the coal mining industry, was investigated over a three year period to assess its importance in the recolonization of a fishless river, the Ebbw Fawr, which is expected to recover from the effects of steelworks effluents discharged near its headwaters. Eight species of fish were recorded. Spawning areas for brown trout were limited by industrial and urban developments and the discharge of suspended solids. Small numbers of native trout were produced in the system and the growth of these fish was poor in the main river, confirming the need for regular stocking. Movements of stocked trout were limited except in the lower reaches of the river where the presence of a native population, high

Effects Of Pollution—Group 5C

levels of suspended solids and flash floods may have increased the numbers of fish moving into the recovering Ebbw Fawr. (Katz)

CHANGES IN THE FISH SPECIES COMPOSI-

CHANGES IN THE FISH SPECIES COMPOSI-TION OF THE GREAT LAKES, Ontario Ministry of Natural Resources, Maple. Fish and Wildlife Research Branch. W. J. Christie.

Journal of the Fisheries Research Board of Canada, Vol 31, No 5, p 827-854, May 1974. 10 fig, 4 tab. 90 ref.

Descriptors: *Great Lakes, *Lake trout, *Oligotrophy, Invasion, *Predation, Lake Erie, *Lake trout, Lake Huron, Lake Superior, Lake Ontario, Lake Michigan, Succession, Competition, Ecosystems, Lampreys, Smelts, Herrings, *Eutrophication, Pest control, Environmental effects, Ecology,

Dominant organisms.

Identifiers: *Sea lamprey, *Burbot, *Alewifes, Overfishing, Pest species.

The case histories of the changes that occurred in each of the Laurentian Great Lakes, as presented for the 1971 symposium on Salmonid Communities in Oligotrophic Lakes, are reviewed. Lakes Huron, Michigan, and Superior passed through a parallel series of stock changes after the invasion by sea lamprey. Lake trout and burbot stocks collapsed, followed by an increase in rainbow smelt, deepwater cisco and alewife stocks. Lake herring stocks collapsed in apparent response to the smelt increase. Eutrophication and more direct pollution stresses had mainly inshore impacts, but the similarity in the species sequencing in the Oligotrophic Great Lakes suggested that their influence before about 1950 was less than that of overfishing and the invasion of exotic species. Control of sea lamprey, overfishing, and eutrophi-cation seemed attainable in the Great Lakes, but the only defense against further invasions by pest species appeared to be maintenance of sufficiently dense piscivore stocks to assure their suppression. (Katz) W74-12264

THE COMMON MUSSEL MYTILUS EDULIS AS INDICATOR FOR THE LEAD CONCENTRA-TION IN THE WESER ESTUARY AND THE GERMAN BIGHT, (DIE MIESMUSCHEL MYTI-LUS EDULIS ALS INDIKATOR FUR DIE BLEIKONZENTRATION IM WESERASTUAR UND IN DER DEUTSCHEN BUCHT), Institut fuer Meeresforschung, Bremerhaven

(West Germany)

For primary bibliographic entry see Field 5B. W74-12265

RESIDUAL CHLORINE RETENTION AND POWER PLANT FISH FARMS.

Oceanic Inst., Waimanolo, Hawaii. C. E. Nash.

The Progressive Fish Culturist, Vol 36, No 2, p 92-95, April 1974. 2 tab, 3 ref.

*Chlorine. *Fish Descriptors: farming. *Powerplants, Pest control, Cooling waters, Safety factors, Industrial wastes, Water pollution,

Sources, Pollutants, Water chemistry, Aquacul-ture, Toxicity. Identifiers: *Residual free chlorine, *Detection systems, Maximum safe flow rate, Diethyl-pphenylene diamine.

The problems created in power plant fish farms by chlorine used to control fouling organisms in both cattorine used to control routing organisms in both saltwater and freshwater circulating systems are discussed theoretically. Chlorine in the power plant discharge could be lethal in aquacultural establishments. (Katz) W74-12266 NITRATE AND NITRITE TOXICITY TO SAL-MONID FISHES

Rhode Island Univ., Kingston. Marine Experiment D. T. Westin.

The Progressive Fish Culturist, Vol 36, No 2, p 86-89, April 1974. 1 tab, 2 fig, 14 ref.

Descriptors: *Salmonids, *Toxicity, *Nitrates, Pistrites, Water pollution effects, Ammonia, Water quality, Chinook salmon, Rainbow trout, Methodology, Toxicants, Hatcheries, Water quality control, Water reuse, Recirculated water, Fishkill, Mortality, Salinity, Freshwater, Sea water, Bioassay.

Identifiers: *Orcorhynchus tshawtscha, TLM, Metabolic wastes

The median tolerance limit (TLM) concentration of nitrates and nitrites were determined for Chin-ook Salmon and Rainbow Trout. The effect of varying salinity on Rainbow Trout after exposure to nitrate and the effect of exposure time on mortality were examined. The relative activity of nitrite to Chinook fingerlings in freshwater was 2,000, 1,480, and 2,700 times that of nitrate in freshwater, at 96-hour, 7 and 10-day TLM, respectively. All of the trout subjected to nitrate concentrations showed acute signs after 2 days exposure, while these signs were not observed in the lower nitrate concentrations until after 5-8 days. Guidelines for hatchery water quality may be set from the data. Best results of growth and good health would indicate nitrate concentrations of 25-35 ppm and 0.12 ppm nitrite. Mode of action of nitrate as a toxicant must still be determined. (Katz) W74-12267

SILVER TOXICITY AND ACCUMULATION IN LARGEMOUTH BASS AND BLUEGILL, Oklahoma Univ. Health Sciences Center,

Oklahoma Univ. Health Sciences Center Oklahoma City. Dept. of Environmental Health. R. L. Coleman, and J. E. Cearley.

Bulletin of Environmental Contamination and Toxicology, Vol 12, No 1, p 55-61, July 1974. 2 fig, 1 tab, 10 ref.

Descriptors: *Bass, *Sunfishes, Metals, *Toxicity, Absorption, *Heavy metals, *Copper, *Zinc, Respiration, Metabolism, Growth rates, Enzymes, Bioassay, Food chains, Laboratory tests, Water pollution effects.
Identifiers: *Silver, Sublethal effects, Bioconcen-

Silver has recently been recognized as a potentially toxic substance in aquatic substances.

Analytical techniques to detect low levels of silver in the environment were unavailable in the Exposure of juvenile largemouth bass and bluegill to silver (0.3 to 70 microgram/liter) resulted in accumulation with highest concentrations in the internal organs of the bass. 70 microgram Ag/l was toxic to the bass within 24 hours but the bluegill tolerated this level for 6 months. Death was apparently due to respiratory disorder with some central nervous system involvement, as indicated by unusual behavior prior to death. The interac-tions of copper and zinc with silver were also in-vestigated. (Katz) W74-12270

IMPACT OF RECENT ECONOMIC GROWTH AND INDUSTRIAL DEVELOPMENT ON THE ECOLOGY OF NORTHWEST MIRAMICHI AT-LANTIC SALMON (SALMO SALAR), Fisheries Research Board of Canada, St. Andrews

(New Brunswick). Biological Station.

Journal of the Fisheries Research Board of Canada, Vol 31, No 5, p 521-544, May 1974. 14 fig,

Descriptors: *Commercial fishing, *Atlantic sal-mon, *Fish management, *Water pollution ef-

fects, Environmental effects, Mine wastes, Domestic wastes, Pulp wastes, Commercial fish, Sport fish, Sport fishing, Salmon, Methodology, Ecology, Life cycles, Insecticides, Water pollu-tion sources, Forests, Smolt, Estuaries, Distribution, Stocking, Reproduction, DDT, Zinc copper. Identifiers: *Canada(Miramichi River).

The history of Atlantic salmon (Salmo salar) runs of the Northwest Miramichi from 1950 to 1973 is reviewed. Decreases in these runs are related to degrading ecological conditions in the river's reaches as a result of adverse chemical conditions attributable to recent developments in forest management and to base metal mining. Diversion of indigenous adult stocks into other streams of or indigenous adult stocks into other streams of the system as a result of pollution of the home stream by mining, pulpmill and other human ac-tivities is examined and evaluated. Increases of commercial catches as a result of pollution-caused delay in the estuary of migrating adults is analyzed. Depletion of stocks as a result of the combined effects of these factors plus distant-water fishing is identified as is incipient recovery of stocks when home-water commercial fishing was eliminated and pollution abatement measures were introduced to the river. A suppressing effect of heavy angling pressure on stock abundance when stocks are low is noted. (Katz) W74-12271

ANTICHOLINESTERASE ACTION IN METHYL PARATHION, PARATHION AND AZINPHOS-METHYL IN MICE AND FISH: ONSET AND RECOVERY OF INHIBITION, Harvard Univ., Boston, Mass. School of Public Harbard

Reattl.

G. M. Benke, and S. D. Murphy.

Bulletin of Environmental Contamination and
Toxicology, Vol 12, No 1, p 117-122, July 1974. 2

Descriptors: *Sunfishes, *Insecticides, *Inhibition, Methodology, Toxicity, Enzymes, Biochemistry, Bioassay, Lethal limit, Laboratory tests, Organophosphorous pesticides, Water pollution effects.

*Azinphosmethyl, Mice, *LC50, Identifiers: *Azinpho *Acetylcholinesterase, *Parathion, Methyl parathion, Recovery.

The lethal ranges of parathion, methyl parathion and azinphosmethyl are 10-200, more than 2500, and 1-10 mg/kg respectively in sunfish. The large differences in these toxicities, relative to mice, (all values between 3 and 15 mg/kg) may be due to the onset and recovery of acetylcholinesterase (AChE) inhibition. This information would be useful in the suggested use of fish brain AChE as a monitor for pollution by organophosphate insecti-cides. The rates of onset of AChE inhibition did not explain the greater toxicity of parathion and azinphosmethyl relative to methyl parathion in sunfish. The rate of onset and recovery from AChE inhibition by all three pesticides in the fish brain and muscle is much slower than in mice and the slow recovery of AChE in fish may make them more susceptible to cumulative injury by these compounds. (Katz) W74-12273

THE TOXICITY OF TETRACHLORODIBENZO-P-DIOXIN IN GUPPIES (POECILIA RETICULATUS PETERS),

Pacific Northwest Forest and Range Experiment

Station, Corvallis, Oreg. L. A. Norris, and R. A. Miller. Bulletin of Environmental Contamination and Toxicology, Vol 12, No 1, p 76-80, July, 1974. 1 fig, 2 tab, 18 ref.

Descriptors: *Toxicity, *2-4-5-T, *Herbicides, Chlorinated hydrocarbon, Pesticides, Organic pesticides, Laboratory tests, Pathology, Reforestation, "Water pollution effects, Environmental effects.

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Identifiers: *TCDD, *Poecilia reticulatus,

TCDD is a contaminant of 2,4,5-trichlorophenoxvacetic acid (2,4,5-T), a herbicide used in reforestation. TCDD is highly toxic to mammals. Its toxicity to aquatic organisms is determined through experimentation with guppies, Poecilia reticulatu Fish were exposed to 0.1, 1.0 and 10.0 ppb TCDD and all died from a 120 hour exposure, the smallest and an died from a 120 hold exposure, the smallest being first affected. All fish were dead 37 days after exposure. Behavioral and pathological signs of distress occurred in fish that survived more than 10 days. The concentrations of TCDD used in these tests were considerably greater than expected to occur in forest streams after aerial application of 2,4,5-T. The threshold response level for TCDD in fish has not been reported. (Katz)

LEAD CONCENTRATION IN NATIVE TROUT, Montana State Univ., Bozeman, Dept. of Chemis-

G. K. Pagenkopf, and D. R. Neuman. Bulletin of Environmental Contamination and Toxicology, Vol 12, No 1, p 70-75, July 1974. 1 fig,

Descriptors: *Lead, *Rainbow trout, Analytic Descriptors: "Lead, "Rainbow trout, Analytic techniques, Spectrophotometry, Bioassay, Salmonids, "Path of pollutants, Heavy metals, Absorption, Trout, Brown trout, Cutthroat trout, Environmental effects, "Montana. Identifiers: "West Gallatin River(Mont).

The concentration of lead in the atmosphere is greatly increased by proximity to highways. The West Gallatin River runs alongside a highway for 40 miles and the lead concentrations found in native trout taken from the river are compared to values for fish taken from fish hatcheries. Water samples were also taken and analyzed. Lead concentrations for gills, bone and tissue were deter-mined, for fish of different ages as estimated by their size and for fish from three location types. Results indicate that there is very little enhance-ment of the lead concentration in the fish, probably because the traffic load of the highway is not large. (Katz) W74-12275

THE SUSCEPTIBILITY OF SELECTED INSEC-TICIDES AND ACETYLCHOLINESTERASE ACTIVITY IN A LABORATORY COLONY OF MIDGE LARVAE, CHIRONOMUS TENTANS (DIPTERA:CHIRONIMIDAE), Ohio State Univ., Columbus. Dept. of Entomolo-

R. E. Karnak, and W. J. Collins.

Bulletin of Environmental Contamination and Toxicology, Vol 12, No 1, p 62-69, July 1974. 2 tab,

Descriptors: *Diptera, *Midges, *Insecticides, *Toxicity, Food chains, Aquatic insects, Pesticides, Enzymes, Bioassay, Larvae, Methodology, Dieldrin, Carbamate pesticides, Lethal limit, Spectrophotometry, Analysis techniques, DDT. Identifiers: *Chironomus** Acetylcholinesterase activity, LC50, Allethrin, Malathion.

Laboratory tests were executed to determine the toxicity of a wide variety of technical grade insectoxicity of a wide variety of technical grade insecticides to midge larvae. Modes of action and physiological aspects of the organism relating to toxicity, including metabolic detoxication, were determined. The larval stage of Chironomus tendents tans was very susceptible to representatives of the major groups of organic insecticides, with dieldrin being the most toxic. The susceptibility may be due to the low activity of protective enzymes which allow for detoxication. The or-ganophosphates and carbamates were toxic by virtue of acetylcholinesterase inhibition. (Katz) W74-12276

CHANGES IN URINE FLOW RATE AND HAE-MATOCRIT VALUE OF RAINBOW TROUT SALMO GAIRDNERI (RICHARDSON) EX-POSED TO HYPOXIA,

Ministry of Agriculture, Fisheries and Food, London (England). Salmon and Freshwater Fisheries

D. J. Swift, and R. Lloyd. Journal of Fish Biology, Vol 6, No 4, p 379-387, July 1974. 4 fig, 2 tab, 25 ref.

Descriptors: *Rainbow trout, *Oxygen, *Urine, Animal physiology, Oxygen requirements, Biochemical oxygen demand, Membrane processes, Osmosis, Biochemistry, Metabolism, Methodology, Dissolved oxygen, Water pollution effects.

*Hypoxia, *Metabolic Identifiers: *Haematocrit, Urine flow rate, Haemoconcentra-tion, Blood volume, Gills, Erythrocytes.

Measurements were made of urine flow rates and haematocrit of rainbow trout exposed to hypoxic conditions (3 mg O2/l) for 3, 4, 5 and 24 hr. Elevated urine flow rates during short time exposure and concomitant increased haematocrit, followed by lower than normal urine flow rates on return to normal aerated water suggest that the haemoconcentration is the initial response to anoxia. Results from longer exposure to hypoxic conditions suggest that the initial period of haemoconcentration is followed by a period of water retention and a return of the blood volume to normal: the sustained elevated haematocrit is thought to be derived from erythrocytes from storage organs. During prolonged exposure rain-bow trout also become more permeable to water. W74-12277

ECOLOGICAL ASPECTS OF AQUATIC BIOLO-GY THROUGH TIME-LAPSE PHOTOGRAPHY, Maryland Univ., Solomons. Center for Environ-mental and Estuarine Studies.

M. J. Reber, and D. G. Cargo.

Maryland Water Resources Research Center, College Park, Completion Report No 25, (1974). 3 p. OWRT A-015-Md(1). 14-31-0001-3020.

*Sea Descriptors: nettles, *Photography, Embryonic growth stage, Biocontrol. Aquatic animals.

Identifiers: Cratena pilata, Chrysaora quinquecirr-ha, *Time-lapse photography, *Nudibranch, Sea

Records of the asexual budding phase of the sea nettle are now on film, however, techniques developed since that time now present the opportunity to improve upon those first images. In the of biological control of the jellyfish, a successful attempt has been made to photographically describe the life cycle of a predator sea slug called a nudibranch. Included in this sequence was the ritualistic mating 'dance' and subsequent mutual exchange of gametes. The cleavage and early development of the fertilized egg was also captured on film. This footage has been shown to various malacological and zoological meetings, classes, groups, etc., all over the country. A unique view of molluscan egg development has been recorded. W74-12345

PREDICTION OF ENVIRONMENTAL QUALITY IN DE-ENRICHED STREAM SYSTEMS, Michigan Univ., Ann Arbor. School of Natural

Michigan Univ., Ann Arbor. School of Natural Resources. F. F. Hooper, and G. R. Southworth. Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 924, \$3.75 in paper copy, \$2.25 in microfiche. Completion Report, Institute of Water Research, Michigan State University, East Lansing, July 1974. 67 p, 22 fig, 22 ref. OWRR A-070-MICH(1). 14-31-0001-4022.

Descriptors: *Periphyton, *Nutrients, Phosphates, Fertilization, Herbivores, Natural streams, *Michigan, Primary productivity, Organic matter, *Eutrophication, Biological communities, Ecosystems, *Environmental effects. Identifiers: *Trout stream ecosystem, *Pigeon River(Mich), Channelized stream systems, Surber samples teaching.

The effects of enrichment with 25 ppb inorganic phosphate on the composition and structure of the benthic invertebrate community of a trout stream ecosystem was investigated in a channelized stream system in the Pigeon River, Otsego County, Mich. This study was designed to assess the importance of periphytic production in determining and maintaining benthic community structure, and to gauge the impact of such low level enrichment on the resource value of the ecosystem. It was also designed to compare the changes wrought by plant nutrient enrichment with those associated with enrichment with organic material. The mean number of taxa per sample was higher in the fertilized than in the controls, and lower in the covered channel. Faunal diversity was relatively unaffected by fertilization, but was significantly unattected by tertuization, but was significantly reduced by organic enrichment and the elimination of periphyton. However, the equitability component of diversity was significantly lowered by fertilization and organic enrichment, and increased slightly with the elimination of periphyton. The results demonstrate that the herbivorous component of the invertebrate community is limited in overall abundance by the availability of food resources. Mild fertilization acts to increase this food resource and decrease the intensity of competition for food among herbivores. Nearly 55% of the common taxa in the experimental area were shown to be affected by variation in periphytic production. W74-12347

EFFECTS OF RESIDUAL TOXINS IN OIL REFINERY EFFLUENTS ON AQUATIC OR-GANISMS,

State Oklahoma Univ., Stillwater, Water Resources Research Inst.
T. C. Dorris, S. L. Burks, and G. R. Waller.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 919, \$4.00 in paper copy, \$2.25 in microfiche. Comple-tion Report, June 30, 1974. 79 p, 17 fig, 20 tab, 3 ref, append. OWRT B-025-OKLA(1). 14-31-0001-3927.

Descriptors: Evaporation. *Toxicity. Discharge(Water), Biological treatment, Lagoons, Discharge(Water), Biological treatment, Lagoons, *Sludge, Bioassay, Minnows, Crustaceans, Ca-tions, Sodium, Calcium, Magnesium, Potassium, Copper, Cadmium, Chromium, Nickel, Lead, Iron, Zinc, Spectrophotometry, Chlorides, Am-monia, Ions, Electrodes, *Oil wastes, Water pollu-tion effects, *Toxins, Chromatography, *Evaporators, *Pollutant identification, Daphnia. Identifiers: Beckman Total Organic Carbon Applyzer.

aboratory evaluations of partial evaporation of oil refinery waste waters were performed to deter-mine (1) removal of toxic substances by partial evaporation (2) suitability for discharge receiving stream of the bottom partially concentrated waters from an evaporator (3) acceptability of overhead evaporator product water for reuse as boiler make-up or other uses. The waste waters from biological treatment-lagoon and activated sludge units-and from primary treatment facili-ties-API separator and air flotation--were partially evaporated in rotating thin-film or columnar falling film evaporators. Toxicity of original sample and overhead and bottom product fractions from evaporator was evaluated by static bioassays with fathead minnows (Pimephales promelas) and small crustaceans (Daphnia magna). Major cations: sodium, calcium, magnesium and potassium and trace heavy metals--copper, cadmium, chromium, nickel, lead, iron and zinc, were

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analyzed with atomic absorption spec-trophotometry. Chlorides and ammonia were analyzed with specific ion electrodes. Organic carbon concentration was analyzed with a Beckman Total Organic Carbon Analyzer. Highly toxic fractions from evaporators were solvent extracted to obtain samples of organic compounds for identifi-cation with gas chromatography mass spectrometry. Conclusions were that partial evaporation of biologically treated oil refinery waste water (1) removes toxic substances from biologically treated oil refinery waste waters (2) produces an overhead product water which has low inorganic salt concentration and should be reusable for boiler make-up or other uses where high-quality water is desirable (3) produces a partially concen-trated bottom product water generally less toxic. W74-12348

FREEZE CONCENTRATION OF TOXIC POL-

LUTANTS FOR BIOASSAY,
Oregon State Univ., Corvallis. Water Resources Research Inst.

For primary bibliographic entry see Field 5A. W74-12349

SOCIO-ECONOMIC IMPACT OF ESTUARINE

THERMAL POLLUTION,
MetroStudy Corp., Washington, D.C.
J. S. Williams, Jr., and S. Spigel.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 034, 84.50 in paper copy, \$2.25 in microfiche. Completion Report, 1974. 117 p, 4 fig, 37 tab, 2 append. OWRT C-4134(No. 9059)(1). 14-31-0001-9059.

Descriptors: *Thermal pollution, *Estuarine environment, *Social impact, *Economic impact, *New Jersey, Political aspects, *Recreation, Estuaries, Water pollution effects, Nuclear powerplants, *Attitudes, Benefits, *Cost-benefit

Identifiers: *Barnegat Bay(NJ).

The impact of thermal pollution from a nuclear power plant on people is indirect and is mediated by the perceived economic impact as well as the perceived environmental impact. Attitudes toward the power plant are primarily a function of the economic impact and secondarily a function of environmental attitudes. Residents who felt they derived economic advantage from a power plant tended to deny any adverse environmental impact. While strong feelings toward nature were associated with negative attitudes toward construction of another nuclear plant, participation in a particular sport or recreational activity provided no basis for prediction of a favorable or unfavorable attitude to the plant. For the immediate area around the Barnegat Bay estuary, the economic analysis showed a favorable ratio of benefits to costs. However, there was a poor distribution of impacts, so that some groups incurred greater costs than benefits. Technical assistance to local political bodies could lead to an early identification of economic disbenefits to local interests and lead to the establishment of a more equal distribution of benefits and costs. W74-12353

IMPACT OF FOREST MANAGEMENT PRAC-TICES ON THE AQUATIC ENVIRONMENT, Quinault Indian Reservation, Taholah, Wash. Quinault Resource Development Program B. J. Allee, and M. Smith.

Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-236 040, \$3.00 in paper copy, \$2.25 in microfiche. Completion Report, (1974). 21 p, 1 tab, 9 fig. OWRT C-4370(No. 9054)(1).

Descriptors: *Forest management, Watershed management, *Salmonids, *Washington, *Productivity, Fish management, Acid streams, Water quality, Toxicity, Hydrogen ion concentration. Forest soils, *Clear-cutting, Organic matter, *Indian reservations.

Identifiers: Cedar leachate, Total organic carbon, *Ouinault Indian Reservation(Wash)

An integrated systems approach has been adopted to determine the effect of forest clear cutting practices on the variation in production of resident salmonids on the Quinault Indian Reservation, a part of the Washington Olympic Peninsula. Resident salmonid production was found to range from .01 g/m2 to over 8 g/m2. Streams low in productivity are characterized by high concentrations of organic materials greater than 50 ppm TOC, larger temperature variations and greater variation in stream discharge. Temporal reduction of salmonids occurred during early fall and coincided with drastic reduction in stream pH levels from greater than 5.5 to less than 4.0. Attempts to distinguish between variation in natural water quality and that caused by forest clear cutting will be made in Phase II of the project. W74-12355

BASIC RESEARCH IN THE AQUATIC ENVIRONMENT: EFFECTS OF EUTROPHICATION ON PHYTOPLANKTON AND SELECTED SPECIES OF AQUATIC VASCULAR PLANTS-PHASE II, Cornell Univ., Ithaca, N.Y. Dept. of Ecology and

Systematics.

J. P. Barlow.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 108, \$3.00 in paper copy, \$2.25 in microfiche. Comple-tion Report, Water Resources and Marine Sciences Center, Cornell University, Ithaca, New York, September 1974. 18 p, 4 fig, 18 ref. OWRT B-024-NY(4).

Descriptors: Aquatic environment. Effects, *Phytoplankton, Eutrophication, *Water quality control, *Nurrents, *Research, Ponds, *Aquatic plants, Growth, Seasonal, Water resources, Management, *New York. Continuous methods. Chemostats, *Cayuga Lake(NY).

An understanding of the effects of specific nutrients on existing plankton populations is necessary for the proper management of water resouces quality control. Recently, nutrient bioassay techniques have been widely used in experiments to identify limiting nutrients and predict the consequences of changes in them. These experiments suffer from numerous disadvantages, an important one being that they are performed under static conditions. It is recommended that continuous flow techniques provide more natural, suitable conditions for determining the effects of nutrients on algal populations. Frequently in such techniques, a chemostat containing the microorganisms is supplied with a nutrient medium at a constant slow rate, displacing a fixed proportion of the contained population via a constant level overflow. Recently, continuous culture has been used to study the selective effect of organic enrichment on natural populations of marine bacteria, and present studies are an extension of this approach. Described are the method used and results found in such experiments made during the winter of 1971-72 in an experimental pond, and shortly after in Lake Cayuga. (See also W74-06835) (Bell-Cornell) W74-12365

INFLUENCE OF THE WATER POLLUTION,

World Health Organization, (Denmark). Regional Office for Europe.

A. Jernelov. In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973. p 115-121, 1973. 1 tab.

Descriptors: *Water pollution effects, *Water pollution sources, *Pulp wastes, *Bleaching wastes, Toxicity, Fish, Aquatic organisms, Anaerobic conditions, Surfactants, Discharge(Water), Pollutants, Color, Lignins, Biodegradation, Biochemi-cal oxygen demand, Organic loading, Chlorination, Polychlorinated biphenyls, Water reuse, Waste treatment, Waste water treatment, Bottom sediments, Fibers(Plant), Eutrophication, Thermal pollution, Mixing, Nutrients, Recreation.

Adverse effects of pulp and paper mill effluents on receiving streams are discussed. They include toxic (lethal and sublethal) effects on fish and other aquatic organisms, color caused by lignin, BOD loading, creation of anaerobic conditions, pollution. formation thermal of (polychlorinated biphenyls) during pulp bleaching with chlorine, changes in nutrient balance, eutrophication, changes in the mixing behavior of water due to discharges of surfactants, persistence of difficulty biodegradable pollutants which aggravate water purification and reuse, fibrous bottom sediments or floating fiber banks that interfere with recreational and esthetic water uses. (See also W74-12400) (Brown-IPC) W74-12406

STUDY ON THE TOXICITY ON FISHES AND THE BIODEGRADABILITY OF THE PAPER-MILL WASTES, IN RELATION TO THE BIOCIDES USED, Ente Nazionale per la Cellulosa e per la Carta,

Rome (Italy). M. Firpi, and V. Scarlata.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 449-489, 1973. 34 fig. 5 tab, 44 ref.

Descriptors: *Toxicity, *Pulp wastes, *Fish, *Pesticide toxicity, *Biodegradation, *Additives, *Water pollution effects, *Water pollution sources, Pesticides, Fungicides, Sulfur compounds, Mercury, Chlorinated hydrocarbon pesticides, Bromine, Organic pesticides, Trout, Rain-

Identifiers: Board mills, Slimicides, White water(Paper-machine), Mercury compounds, Bromine compounds, Tin compounds, Tin, Metalorganic(Organometal) compounds, Parchment paper(Vegetable parchment), Goldfish(Carassius

The toxicity of five slimicides and fungicides commonly used in pulp and paper mill water circuits was studied on goldfish (Carassius auratus) and rainbow trout (Salmo gairdneri), and compared with the toxic effects on effluents from linerboard, coated board, and vegetable parchment (parchment paper) mills. The biocides included pentachlorophenol sodium salt, organic tin compounds, phenylmercuric acetate, 2-bromo-4-hydroxy-acetophenone, and a mixture of 2-thio-cyanomethylthiobenzothiazole plus 2-hydrox-ypropylemthane-thiosulfonate. The data obtained were correlated with the biodegradability of papermachine white waters in the presence of microorganism nutrients. Among the most important findings were: Most biocides retard or inhibit the biodegradation of waste waters. Among the five pesticides tested, the Br compound was the most toxic and, along with the Hg compound and the sulfur compound mixture, must be considered as dangerous to the environment. These three compounds would interfere with the self-purification of streams and with natural BOD-removing microorganisms, such as activated sludge bacteria. Waters containing these additives tended to retain a low pH. Nonetheless, most paper mill effluents impose lower pollution loads on receiving streams than do the discharges of many other industries. (See also W74-12400) (Brown-IPC) W74-12419

Group 5C-Effects Of Pollution

OCCUPATIONAL EXPOSURE TO INORGANIC COMPOUNDS OF LEAD,
Institute of Occupational Health, Zabrze (Poland).

For primary bibliographic entry see Field 5A. W74-12483

RERVILLIUM.

For primary bibliographic entry see Field 5A. W74-12487

LOW-MOLECULAR-WEIGHT PROTEINS IN ITAI-ITAI DISEASE,
Gunma Univ., Maebashi(Japan). Dept. of Hy-

giene.

K. Nomiyama, Y. Sugata, I. Murata, and Y. Nakagawa.

Environmental Research, Vol 6, No 4, p 373-381, December, 1973. 1 tab, 3 fig, 26 ref.

Descriptors: *Cadmium, *Toxicity, *Human pathology, *Urine, Diets, *Proteins, Water pollution effects.

Identifiers: *Itai-Itai disease, *Japan(Zinzu River).

The etiology of the so-called Itai-Itai disease has been thought to relate to malnutrition and dietary cadmium exposure. Itai-Itai disease, named after its severe pain, was endemic in Zinzu River area in Japan; its characteristic signs and symptons were osteomalacia and renal tubular dysfunction. Urinary low-molecular-weight proteins have been reported to be characteristic of renal tubular dysfunction. The components of urinary lowmolecular-weight proteins in Itai-Itai disease are suggested to be retinol-binding protein and beta 2microglobulin as determined by gel filtration, disc electrophoresis and immunoassay. Furthermore, vitamin D administration at a large dose is discussed and though to contribute to the aggrava-tion of renal tubular dysfunction in Itai-Itai disease. (Jernigan-Vanderbilt) W74-12490

MERCURY POISONING TAKES ITS TOLL IN JAPANESE FISHERMEN AND FAMILIES,

M. Nozaki. Journal of Environmental Health, Vol 36, No 6, p 552-553, May/June, 1974. 1 fig, 7 photo.

Descriptors: *Mercury, *Toxicity, *Public health, *Human pathology, Organic compounds, Industrial wastes, Contaminants, Pollutants, Food, *Water pollution effects.

Identifiers: *Methylmercury, *Japan(Minamata

The effects of methylmercury pollution of the fishermen of Minamata Bay from 1953 to 1974 are summarized. In 1956, Dr. Takeuchi began investigations of the outbreak of a heretofore unknown disease. In 1963 he reported that methylmercury was definitely the active agent affecting the nervous system. 674 cases of Minamata Disease have been officially reported as of February 8, 1974, including 90 deaths. Photographs of victims are presented. (Jernigan-Vanderbilt) W74-12491

CADMIUM IN THE ENVIRONMENT, II, Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene. For primary bibliographic entry see Field 5B. W74-12492

BIOLOGICAL DIFFERENCES IN CADMIUM

AND ZINC TURNOVER,
Oklahoma Univ., Oklahoma City. Dept. of Environmental Health. Z. A. Shaikh, and O. J. Lucis.

Archives of Environmental Health, Vol 24, No 6, p 410-418, June, 1972. 6 fig, 3 tab, 30 ref.

Descriptors: *Cadmium, *Zinc, *Biochemistry, Rodents, Mammals, Laboratory tests, Laboratory animals, Analytical techniques, Electrophoresis, Path of pollutants, Radioisotopes.

In rat plasma, Cd109 was mainly associated with alpha-globulin fraction and Zn65 was bound to alpha- and beta-globulins. Subcutaneously injected cadmium chloride Cd109 and zinc chloride Zn65 resulted in rapid clearance of Cd109 from blood plasma, as compared to Zn65. Blood cells accumulated Zn65 more rapidly than Cd109. Greatest uptakes of Cd109 per unit weight of tissue were by liver, kidneys, and pancreas, but that of Zn65 was by the pancreas. From all tissues, Zn65 was depleted eventually. In the first six hours after isotope dose, testis tissue concentrated nours after isotope dose, tests tissue concentrated more Cd109 than Zn65. In tests, Zn65-influx continued for i68 hours, without further Cd109 increase. Both isotopes were excreted predominantly via the intestinal tract. Fecal and urinary excretion of Cd109 and Zn65 was accelerated by 2,3-dimercapto-1-propanol. Results indicate Cd109 follows metabolic pathways different from those of Zn65. (Jernigan-Vanderbilt) W74-12493

PRESYNAPTIC AND POSTSYNAPTIC EFFECTS OF LEAD AT THE FROG NEU-ROMUSCULAR JUNCTION, Cincinnati Univ., Ohio. Coll. of Medicine. R. S. Manalis, and G. P. Cooper. Nature, Vol 243, p 354-356, June 8, 1973. 4 fig, 28

Descriptors: *Lead, *Animal physiology, Laboratory tests, Testing procedures, *Frogs, Lethal limit. Identifiers: Sublethal effects, *Synaptic effects.

Lead has long been known to be toxic to animals and humans, with some of its effects being attributable to actions on the neuromuscular system. It is shown that lead influences both pre- and postsynaptic events in neuromuscular transmission with the presynaptic ones being most sensitive. Experiments were performed in vitro on the isolated sciatic nerve-sortorius muscle preparation of the frog (Rana pipiens). Superficial neuromuscular junctions were located optically with a compound microscope (X400) standard microelectrode and photographic techniques were used to monitor intracellular responses from individual end-plates. It was concluded that lead reduced the end-plate potential by a presynaptic block and not by a postsynaptic one. To confirm this conclusion, other experiments were performed to see if lead decreased the ACh sensitivity of the postsynaptic (end-plate) membrane. The results showed that lead can only block postsynaptically in conditions in which the density of ACh-receptor complexes is much lower than it is during an end-plate potential. (Jernigan-Vanderbilt) W74-12494

MATERNAL-FETAL TRANSFER OF ORGANIC AND INORGANIC MERCURY VIA PLACENTA AND MILK,

Vanderbilt University, Nashville, Tennessee. For primary bibliographic entry see Field 5B. W74-12495

CHARACTERISTICS OF BACTERIOPLANK-TON OF THE URAL RIVER IN THE ORENBURG REGION, (IN RUSSIAN), Gosudarstvennyi Meditsinskii Institut, Orenburg (USSR). Dept. of Biology.

G. N. Solovykh. Mikrobiologiya. Vol 42, No 2, p 336-339, 1973. En-

glish summary. Identifiers: *Bacteria, Orenburg, *Plankton, *USSR(Ural River).

The bacterioplankton of the Ural river (USSR) and its seasonal dynamics were studied. The total bacterial number in waters of the Ural river near Orenburg was 300-3338 1,000 cells/ml. The maximum bacterial numbers were detected in the spring and in the autumn. The number of saprophytic bacteria in the river varied from 200-44,000 cells/ml with the minimum in winter and the maximum in summer autumn. The coli-index was 200-1400 cells/L and only sometimes reached 28,00 cells I. The number of bacteria oxidizing hydrocarbons was 10-1,000,000 cells/mn. Desulfurating bacteria were rarely distributed in the Ural river, and their number was low. The qualita-tive composition of the bacterioplankton was varied. The waters contained spore-forming bacteria, various rods, cocci, azotobacter-like cells, and yeasts. The ratio between rods and cocci was 1:3.--Copyright 1973, Biological Abstracts, Inc. W74-12497

METHYLMERCURY-INDUCED

CHROMOSOME DAMAGE IN MAN. University Hospital, Lund (Sweden). Dept. of Occupational Medicine.

S. Skerfving, K. Hansson, C. Mangs, J. Lindsten,

and N. Ryman. Environmental Research, Vol 7, No 1, p 83-98, February, 1974. 2 fig, 5 tab, 30 ref. SNEPB (7-29/68 and 7-15/71) SMRC 19X-3681.

Descriptors: *Mercury, *Organic compounds, *Chromosomes, *Cytological studies, Biology, Genetics, Fish, Public health, Human pathology, Laboratory tests, Testing procedures, Water pollution effects.

Identifiers: *Methylmercury.

Lymphocytes from blood cultures from 23 subjects exposed to methylmercury through intake of fish from contaminated waters and from 16 'nonexposed' subjects were studied cytogenetically. These were statistically significant relation-ships between frequencies of cells with chromatid-type aberrations, 'unstable' chromosome-type aberrations, and aneuploidy on the one hand and blood-cell mercury levels on the other. In the exposed subjects the blood-cell/plasma mercury ratio was high, which is chracteristic for exposure to short-chain alkylmercury compounds as opposed to the low ratio seen at exposure to inorganic mercury. Some of the exposed subjects approached, and in one case by far exceeded, the level of 400 mg/g blood cells assumed to have been aberrations, and aneuploidy on the one hand and level of 400 ng/g blood cells, assumed to have been present in sensitive subjects suffering nervous system damage. However, none of the persons studied showed clinical evidence of methylmercury poisoning. The significance of these findings for the health of the subjects and their offspring is not known. In 11 of the exposed subjects, repeated samples were obtained during periods of 6 months to 3 years. No statistically significant relationship between variations in blood-cell mercury and chromosome aberrations could be established. (Jernigan-Vanderbilt) W74-12503

RETENTION OF TWO MERCURIALS BY STRIPED MULLET, MUGIL CEPHALUS, National Marine Water Quality Lab., Johns

For primary bibliographic entry see Field 5B. W74-12504

COMPARISON OF CADMIUM 115M RETEN-TION IN RATS FOLLOWING DIFFERENT ROUTES OF ADMINISTRATION, National Water Quality Lab., Cincinnati, Ohio.

Newtown Fish Toxicology Lab. For primary bibliographic entry see Field 5B. W74-12505

COUGH RESPONSE AND UPTAKE OF MERCU-RY BY BROOK TROUT, SALVELINUS FON-TINALIS, EXPOSED TO MERCURIC COM-

Effects Of Pollution—Group 5C

POUNDS AT DIFFERENT HYDROGEN-ION

CONCENTRATIONS,
National Water Quality Lab., Duluth, Minn.
R. A. Drummond, G. F. Olson, and A. R. Batterman.

Transactions of the American Fisheries Society, Vol 103, No 2, p 244-249, April, 1974. 3 fig, 1 tab,

Descriptors: *Mercury, *Brook trout, *Organic compounds, *Lake Superior, *Toxicity, Laboratory tests, Laboratory animals, Fish, Testing procedures, Analytical techniques, Spectroscopy, Absorption, Hydrogen ion concentration.

The lowest concentration of methylmercuric chloride (MMC) and mercuric chloride added to Lake Superior water that caused a significant increase in cough frequency in brook trout was 3 micrograms Hg/liter. Cough frequency is a good short-term indicator of the long-term effects of MMC. The response can be used to predict the safe concentration of mercuric chloride since the long-term effects of this compound are not known. Increases in cough frequency were proportional to the concentration (from 3 to 12 micrograms Hg/liter) of both compounds at pH 7.5. The fish were more responsive to MMC when the pH of the test water was lowered to 6.0; response to mercuric chloride was not changed by lowered pH. Fish exposed to MMC at pH 6.0 contained more total mercury in their gills and red blood cells than fish tested at pH 9.0. The uptake of mercury by brook trout exposed to mercuric chloride did not differ significantly at pH 6.0 and 9.0. (Jernigan-Vanderbilt) W74-12507

ZINC, COPPER, MANGANESE IN THE RAZOR CLAM, SILIQUA PATULA, Oregon State Univ., Corvallis. Dept. of Oceanog-

For primary bibliographic entry see Field 5B. W74-12511

LEAD CONCENTRATIONS IN THE WOOLY SCULPIN CLINOCOTTUS ANALIS, COL-LECTED FROM TIDEPOOLS OF CALIFORNIA, California Univ., Los Angeles. Dept. of Biology. For primary bibliographic entry see Field 5B. W74-12515

UNIVERSITY OF TORONTO STUDIES REVEAL TOXIC METALS IN SLUDGES USED FOR SOILS.

For primary bibliographic entry see Field 5B. W74-12516

'NORMAL' LEAD AND CADIUM CONTENT OF THE HUMAN KIDNEY,

Veterans Administration Hospital, Birmingham, Ala. Trace Metals Lab.

J. M. Morgan Archives of Environmental Health, Vol 24, No 6, p 364-368, June, 1972. 4 tab, 36 ref.

Descriptors: *Lead, *Cadmium, *Human pathology, *Spectroscopy, Absorption, Distribution, Average, Pollutant identification.

Identifiers: *Kidney(Human), Background levels, Hypertension.

Cadmium and lead have been shown to cause hypertension, accelerated atherosclerosis, kidney disease, and neoplasia in experimental animals. Since both metals accumulate in the kidney, renal concentrations may reflect prolonged exposure. To evaluate effects of long-term moderate expo-sure, 'normal' concentration must first be established in man on the basis of autopsy studies. Increased renal lead was not associated with hypertension or neoplasia, although longevity was compromised as a result of clinical lead poisoning. Renal cadmium has been previously shown to be increased in man in association with neoplasia and emphysema. (Rowe-Vanderbilt)

PREVENTION OF LONG-TERM SEQUELAE FOLLOWING THE ABSORPTION OF LEAD. Chloride Electrical Storage Co. Ltd., Manchester

(England). D. Malcolm.

Archives of Environmental Health, Vol 23, No 4, p 295-298, October, 1971. 2 tab, 28 ref.

*Pollution abatement. *Absorption, *Human pathology, Environmental control. Distribution. Mortality, Industrial wastes, Air pollution effects.

Identifiers: Hypertension, *Sequelae.

The initiation, in 1927, of modern measures of environmental control and medical supervision has reduced greatly the severity of exposure of employees of a storage batter factory to lead and has eliminated the occurrence of outright lead poisoning. An attempt was made to determine the extent to which the chronic effects of low-grade exposure to lead had been prevented by comparing the mor-tality and incidence of vascular hypertension and fatal cerebrovascular accidents among retired and currently employed persons of record with that of employees of a much later period, during which inplant exposure to lead has been reduced to levels plant exposure to lead has been reduced to le now considered to be safe. (Rowe-Vanderbilt) W74-12518

CHROMIUM COMPLEXES WITH PROTEINS AND MUCOPOLYSACCHARIDES AND THEIR RELATIONSHIP TO CHROMIUM ALLERGY IN SENSITIZED GUINEA PIGS,
Pennsylvania Univ., Philadelphia. Dept. of

Dermatology. S. A. Katz, D. M. Scheiner, A. W. Klein, and M.

Environmental Research, Vol 7, No 2, p 212-219, April, 1974. 4 fig, 1 tab, 10 ref. HEW (HO 00303) PHS (AM 0526).

Descriptors: *Chromium, *Proteins, *Laboratory animals, Animal physiology, Small animals(Mammals), Laboratory tests, Testing procedures. Identifiers: *Chromium allergy, Guinea pigs.

The role of proteins and mucopolysaccharides as carriers for chromium in allergic eczematous dermatitis has been described by other investigators. This study is an attempt to extend these previous findings to a model for chromium allergy in chromium sensitized guinea pigs and to study the binding of chromium to proteins and mucopolysaccharides. Theoretical considerations and equilibrium dialysis were utilized to refute previous reports on the amounts of chromium that can be complexed to proteins and mu-copolysaccharides. Purified chromium complexes containing no free chromium were then used to test chromium --- sensitized guinea pigs. The chromium-albumin complex is the only one of those studied found to reproducibly elicit a response. It was concluded that chromium-complexes are not directly involved in the allergic response mechanism, but at this time the apparent discrepancy associated with the chromium-mu-copolysaccharide complexes cannot be explained. (Jernigan-Vanderbilt) W74-12519

COMPARTMENTAL ANALYSIS FOR THE **EVALUATION OF BIOLOGICAL HALF-LIVES** OF CADMIUM AND MERCURY IN MOUSE OR-GANS.

GANS, Tokyo Univ. (Japan). School of Health Sciences. For primary bibliographic entry see Field 5B. W74-12520

A METHOD TO MONITOR THE EFFECTS OF TOXICANTS UPON BREATHING RATE OF LARGEMOUTH BASS (MICROPTERUS SAL-

LARGEMOUTH BASS (MICROPTERUS SAL-MOIDES LACEPEDE), National Inst. for Water Research, Pretoria, (South Africa); and Council for Scientific and In-dustrial Research, Pretoria (South Africa). W. S. G. Morgan, and P. C. Kuhn. Water Research, Vol 8, No 1, p 67-77, January, 1974. 10 fig, 3 tab, 18 ref.

Descriptors: *Monitoring, Pollutants, Micropterus species, Laboratory animals, Fish, *Industrial wastes, Copper, Cadmium, Cyanide, Instrumentation, Testing procedures, Water pollu-tion effects, *Respiration. Identifiers: *Fish respiration disease.

Research into the effects of toxicants upon opercular rhythm has already established a distinct relationship between pollution and respiratory activity in fish. The purpose of this research was not only to confirm that the system may be used for a wide range of industrial pollutants, but also to at-tempt to delineate the limit of respiratory response to various acute and sub-lethal concentrations of toxicants. An apparatus was designed to measure continuously the effects of nominal concentrations of copper, cadmium, phenol, ammonia, and cyanide upon breathing rates in largemouth bass. Acute and sublethal toxic effects were indicated in a majority of cases by increased breathing rate. The use of this reaction and the monitoring apparatus to monitor a wide range of industrial pollu-tants was shown to be practicable. Consideration is also given to its possible application in local situations. (Jernigan-Vanderbilt)

EFFECTS OF SIMULTANEOUS VARIATIONS OF DIEL CHANGES OF TEMPERATURE, DIS-SOLVED OXYGEN, SALINITY, AND A POLLU-TANT ON THE GROWTH OF WHITE CAT-

Connecticut Univ., Storrs. Inst. of Water Resources

W. R. Whitworth.

Completion Report, 1974. 5 p, 1 tab. OWRT A-036-CONN(1). 14-31-0001-3207.

Descriptors: Water pollution effects, Fish physiology, *Growth rates, *Toxicity, *Aluminum, *Water temperature, *Dissolved oxygen, *Sodium chloride, Fishkill, *Catfishes, Salinity, Bioassay. Identifiers: Fish toxicology, *Alum, White catfish.

Three long-term bioassays (8, 79 and 156 days) were performed in closed growth chambers with continuous waterflow to determine the growth and mortality responses of white catfish (Ictalurus catus L.) exposed to 2 diurnally fluctuating temperature and oxygen ranges and 3 diurnally fluctuating dissolved aluminum as alum (Al2 (SO4)3. 14H20) and sodium chloride levels. One long-term bioassay(242 day) was performed in open tanks to determine growth responses of white catfish to 2 diurnally fluctuating temperature ranges and 2 diurnally fluctuating dissolved aluminum (as alum) and sodium chloride levels. Short-term bioassays (24, 48 and 96 hours) were performed on 8 species of freshwater and estuarine fishes and the stability of alum solutions was measured. Reduced growth rates and mean weights were exhibited by white catfish exposed to the highest fluctuating levels of temperature, oxygen, aluminum and sodium chloride. Eight species of fish had 96-hour TLM's (concentration at which 50% of the specimens would die) of 8.0 to 21.9 mg/liter Al. Aluminum solutions (15 and 50 mg/liter) were reduced at rates of .021 to .271 and .104 to .167 mg/liter/hr. (deLara-Connecticut) W74-12524

MARITIME SANDS, For primary bibliographic entry see Field 2L. W74-12556

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STUDIES ON SOUTH AMERICAN FRESH-WATER PLANKTON. NOTES ON THE PLANK TON FROM TIERRA DEL FUEGO AND VAL-DIVIA.

Uppsala Univ. (Sweden). Inst. of Plant Ecology. K. Thomasson.

Annales Societatis Tartuensis ad res Naturae Investigandas Constitutate, Vol 1, p 52-64, 1957. 5 fig, 1 tab, 20 ref.

Descriptors: *South America, *Plankton, Freshwater, Temperate, Lakes, Chemical properties, Physical properties, Hydrogen ion concentration, Systematics.

*Tierra Identifiers: del Fuego(Argentina), *Valdivia(Chile).

Plankton species collected in 1940 from lakes in Tierra del Fuego and Valdivia are described. Water samples collected at the same time from Lago Fagnano, Lago Roca, Cabecera Lago, and Laguna de la Peninsula, Tierra del Fuego were analyzed in Uppsala for transparency, color, hydrogen ion concentration, conductivity, iron, manganese, chlorine, sulfate, total phosphorus, and total nitrogen. The pH was measured in situ. Some of the plankton species collected at Tierra del Fuego and Valdivia were new and are described with notes and drawings. (Auen-Wisconsin) W74-12557

THE VEGETATION OF SWEDISH LAKES, G. Lohammar.

Acta Phytogeographica Suecica, Vol 50, p 28-48, 20 fig, 41 ref.

Descriptors: *Aquatic Geomorphology *Distribution. Shores. Phosphorus, Nitrogen, Acidity, Turbidity, Systematics, Eutrophication, Oligotrophy, Temperature, Chemical properties, Light penetration, Water level fluctuations, Littoral. Identifiers: *Sweden.

There are an estimated 96,000 lakes in Sweden, only a few of the larger in existence before glacia-tion. The temperature in July is about the same in all lowland Sweden; from the Gulf of Bothnia summer temperatures decrease to the west with increasing altitude. Dissolved substances vary within wide limits, the majority having low contents of dissolved minerals. Phosphorus and nitrogen are generally minimal, the highest values measured in lakes of the clayey plains where human habitation and agriculture increase the nutrient input. Most lakes have a neutral or weakly acid water with a summer pH between 6 and 8. Water transparency is probably below 3 m in most lakes. Aquatic plants occur all over Sweden--ex-cept in the alpine regions. The three most impor-tant helophytes are Phragmites, Scirpus lacustris and Equisetum fluviatile. In the oligotrophic lakes of southern Sweden, during summer low water, the exposed flowering mats of Litorella and in shallow water close to shore, large stands of flowering Lobelia appear, intermingled with Isoetes lacustris. Vascular aquatics are listed according to distribution. Changes in aquatic vegeta-tion are recorded resulting from meiotrophy, climatic change, and human influence. (Jones-Wisconsin) W74-12558

NOTES ON THE PLANKTON OF LAKE BANG-WEULU.

Nova Acta Regiae Societatis Scientiarum Up-saliensis, Ser IV, Vol 17, No 12, p 3-43, 14 fig, 2

Descriptors: *Algae, *Plankton, *Africa, Lakes, Swamps, Systematics, Tropical regions, Aquatic plants, Distribution, Vegetation. Identifiers: Lake Bangweulu(Rhodesia), Desmids. The eastern shore of Lake Bangweulu, Northern Rhodesia merges into the vast Bangweulu Swamp containing many open pools and small lakes from which plankton samples were collected. In spite of the random character of the samples there were a great variety of taxa present, many of them of great geographical and/or taxonomical interest. They are listed and extensive notes given. In the small Lake Wumba the following plants were frequent in the sample: Desmidium occidentale, Closterium kuetzingii, Micrasteria foliacea, and M. radiata. In the swamp Lake Chali, the dominant phytoplankter was Botryococcus braunii. In Lake Chaya, another swamp lake, the plankton commu-nity was dominated by Oscillatoria limosa, Melosira granulata, and M. nyassensis. M. agas-sizii is extremely rare. From Bwalya Mponda Lagoon a sample contained great quantities of detritus and sterile threads of Spirogyra. From an arm of Lake Bangweulu, the plankton composition was close to that of Lake Bangweulu, but instead of Zygnemales, it was dominated by Cyanophyta. One of the most interesting points is the discovery of many asymmetrical desmids, which seem to be sparse but widely distributed. (Jones-Wisconsin) W74-12559

ECOLOGICAL EFFICIENCY OF A PELAGIC MYSID SHRIMP: ESTIMATES FROM GROWTH, ENERGY BUDGET, AND MORTALITY STUDIES,

National Marine Fisheries Service, La Jolla, Calif. Fishery-Oceanography Center. R. I. Clutter, and G. H. Theilacker.

R.I. Clutter, and G. H. Theilacker. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as COM-73-10522. Fishery Bulletin, Vol 69, No 1, p 93-115, 1971. 15 fig. 8 tab, 60 ref. (Report No. NOAA-73030901-4). NSF-GB 7132.

Descriptors: *Energy budget, *Productivity, *Shrimp, Reproduction, Fecundity, Larvae, Biochemistry, Metabolism, Respiration. Identifiers: Metamysidopsis elongata, Molting

Energy units provide a means of expressing productivity in terms common to all organisms. Through laboratory studies of growth, molting, reproduction, respiration, body composition, and energy content, an energy budget was constructed for the pelagic mysid shrimp Metamysidopsis elongata. The energy budget data, together with estimates of natural population mortality rates, are used to estimate net and gross ecological efficiencies for the field population. Average growth and molting rates were determined by rearing the mysids in the laboratory. Size specific fecundity was determined from field and laboratory observations. The calorie contents of the mysids, their molts, eggs and larvae were estimated by bomb calorimetry and partially from biochemical composition. The energy used in metabolism was calculated from size specific respiration and data on body composition. The amount of energy lost in molts varies with age because the size of the molt increases and the molting frequency decreases. The net ecological efficiency (yield/assimilated) of population of Metamysidopsis elongata (Crustacea, Mysidacea) is estimated to be 32% The gross ecological efficiency (yield/ingested) is probably between 19% and 29%. (Jones-Wisconsin) W74-12561

THE BIOLOGY OF BLUE-GREEN ALGAE.

University of California Press, Berkeley and Los Angeles. 1973. 676 p.

Descriptors: *Biology, *Cyanophyta, Metabolism, Synthesis, Plant physiology, Cytological studies, Photosynthesis, Structure, Chemical properties, Lipids, Proteins, Pigments, Genetics, Viruses, Nitrogen fixation, Movement, Plankton, Ecology, Marine algae, Hot springs, Carbon, Systematics, Evolution, Cultures, Carbonates, Algae.

Identifiers: Nucleic acids, Heterocysts, Collections, Anacystis nidulans, Thermophilic algae.

This compilation of studies on blue-green algae gives an account of most aspects of blue-green algal biology that are of general interest, or are currently the subject of particularly marked attention especially in relation to environmental deterioration. Few changes in taxonomy of blue-green algae have taken place in the past forty years, but knowledge of their morphology has been recast and expanded by electron microscopy. A wide variety of disciplines for study of the blue-green algae have been employed and are recorded in this volume. Significant was the separation of prokaryotic types. The implication of the 'bacterial-nature' of blue-green algae with the consequent anomaly of their possessing a higher-plant type photosynthetic system, has called for increased attention. Some of the 25 papers, for example, discuss the synthesis of metabolic intermediates, metabolic control and autotrophic physiology, structure and function of nucleic acids, mutagenesis and genetic recombination, nitrogen fixation, photomorphogenesis and nostocacean development, physiology and ecology of marine blue-green algae, ecology of blue-green algae in hot springs, and autotrophy and heterotrophy in unicellular blue-green algae. The four appendices give a list of culture collections and techniques for culture. (See W74-12563 thru W74-12591) (Jones-Wisconsin) W74-12562

SYNTHESIS METABOLIC INTER-MEDIATES,

Wales University Coll. of Wales, Aberystwyth. Dept. of Biochemistry.
A. J. Smith.

In: The Biology of Blue-Green Algae, p 1-38. University of California Press, Berkeley and Los Angeles, 1973. 5 fig, 5 tab.

*Synthesis, *Metabolism, Descriptors: *Cyanophyta, Photosynthesis, Carbon dioxide. Plant growth, Organic compounds, Light, Enzymes, Biochemistry, Plant physiology, Algae. Identifiers: *Metabolic intermediates, Photoassimilation, Obligate phototrophs.

Much work on the intermediary metabolism of blue-green algae has been directed to the elucidation of the biochemical basis of their obligate growth characteristics. Many species, both fila-mentous and unicellular, have been shown to assimilate a wide range of organic compounds in the light and to incorporate them into a variety of metabolically related cell constituents. Studies show that blue-green algae like their obligately chemolithotrophic counterparts are not generally impermeable to organic compounds and are therefore not restricted to carbon dioxide as the carbon source. Those species which are apparently unable to grow on organic media in the dark (all unicellular and many filamentous species) are best classified as obligate phototrophs; this places the emphasis more on the energy source rather than the carbon source for although these organisms can utilize organic compounds in cell synthesis many appear unable to dispense with light for significant growth. Existence of specific metabolism lesions in cyanophytes raises possibility that the obligate character of many may be due to specific obligate character of many may be due to specific enzyme deficiencies preventing or severely limiting dark heterotrophic growth whilst permitting growth in light. It is not possible to identify with certainty the biochemical basis of their obligately phototrophic physiology. (See also W74-12562) (Jones-Wisconsin) W74-12563

METABOLIC CONTROL AND AUTOTROPHIC

PHYSIOLOGY, Liverpool Univ. (England). Dept. of Biochemistry.

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In: The Biology of Blue-Green Algae, p 39-65, University of California Press, Berkeley and Los Angeles, 1973. 6 fig. 4 tab.

Descriptors: *Cyanophyta, *Metabolism, *Plant physiology, Carbon, Growth rates, Respiration, Enzymes, Amino acids, Synthesis, Biochemistry, Cytological studies, Algae.
Identifiers: *Autotrophic physiology, Electron

transport, Biosynthesis, Cytochromes

Studies with obligate phototrophs on the assimilation of organic material, oxidative and dark electron-transport activities, and control of enzymic activity are summarized. The relationship of these processes to the growth physiology of some bluegreen algae is examined. Autotrophs are defined as organisms that require an energy source other than oxidation of reduced carbon. A striking feature of the photo-assimilation of carbon compounds by many blue-green algae, and certainly of Anabaena variabilis and Anacystis nidulans, is the inability of the exogenous carbon source to increase growth or respiratory rates. It has been established that blue-green algae have low, but consistent rates of oxygen consumption in the dark. Respiratory electron transport is discussed in connection with cytochromes, reduced pyridine nucleotide oxidase systems, and phosphorylation. Regarding control of enzymatic activity, tentative conclusions may be drawn that blue-green algae lack metabolic con-trol by repression and de-repression of enzyme biosynthesis found in other microorganisms. In contrast, examples of enzymic control by allosteric alteration of enzymes, by end-products or substrate precursors, have been observed. No species has been described so far that cannot elaborate a proportion of its cell material from reduced carbon sources. (See also W74-12562) (Jones-Wisconsin)

ARRANGEMENT AND STRUCTURE OF

THYLAKOIDS, California Univ., Davis, Dept. of Botany; and Durham Univ. (England). Dept. of Botany. N. J. Lang, and B. A. Whitton.

In: The Biology of Blue-Green Algae, p 66-79, University of California Press, Berkeley and Los Angeles, 1973. 17 fig.

Descriptors: *Cyanophyta, *Cytological studies, *Structure, Environmental effects, Light intensi-ty, Plant physiology, Plant morphology, Algae. Identifiers: *Thylakoids.

The most widespread arrangement of thylakoids (flattened membranous sacs) in cyanophyte vegetative cells is that where some membranes at least can be seen in any region of the cell but where, nevertheless, there is a marked tendency for concentration toward the cell periphery. Where the great majority thylakoids peripheral, they are generally oriented parallel to the longitudinal cell wall. Direct connections between the plasmalemma and outer thylakoids have been reported in a range of species. While there is considerable variation in arrangement and structure of thylakoids in vegetative cells of bluegreen algae, many features found either in cells of photosynthetic bacteria or in most chloroplasts have never been reported for blue-green algae. Effects of light intensity and temperature are re-ported. Although there have been only a few studies illustrating ultrastructure of akinetes, in general, the arrangement of thylakoids is similar to that in vegetative cells prior to their enlargement and differentiation. While it is becoming relatively easy to provide morphological explanations for some features of the arrangement of thylakoids within blue-green algal cells, there are few clues as to what extent different functions are associated with these different arrangements. (See also W74-12562) (Jones-Wisconsin) W74-12565

PROTOSYNTHETIC REACTIONS AND COM-PONENTS OF THYLAKOIDS.

Purdue Univ., Lafayette, Ind. Dept. of Biochemis-

W. Krogmann.

In: The Biology of Blue-Green Algae, p 80-98, University of California Press, Berkeley and Los Angeles, 1973. 3 fig. NSF GB 27466.

Descriptors: *Cytological studies, *Biochemistry, Descriptors: *Cytological studies, Pigments, *Cyanophyta, Photosynthesis, Pigments, Chlorophyll, Oxidation-reduction potential, Algae.
*Identifiers: *Thylakoids, Electron flow, Photosynthetic reactions.

Individual steps in electron flow during photosynthesis and overall sequence of reactions are considered. Use of NADPH as the reductant of phosphoglyceric acid may represent an evolutionary break by the blue-green algae from other photosynthetic prokaryotes. Evidence is appearing that structure of the pigment complexes in blue-green algae can be altered by energy-dependent conformational changes in the photosynthetic membranes. P-700 is the site of conversion of light energy into chemical work in Photosystem I. While there has been some controversy over which redox carrier reduces P-700, current evidence favors the copper protein, plastocyanin. The sequence of electron carriers between the c type cytochrome and Photosystem II is not clear. A sequence plastoquinone, cytochrome b, cytochrome c had been postulated for higher plant materials based on the redox potential but recent revisions in the estimated redox potential of cytochrome b indicate that it reduces plastoquin-one which in turn reduces the 'c' type cytochrome. Photosystem II provides the electrons which are sent through the chain of carriers described. The cyclic phosphorylation activity of lamellae from Anabaena variabilis appears to be quite similar to that found in higher plant chloroplasts. (See also W74-12562) (Jones-Wisconsin) W74-12566

FINE STRUCTURE AND CHEMICAL COM-POSITION OF THE CELL ENVELOPES, Freiburg Univ. (West Germany). School of Microbiology.

In: The Biology of Blue-Green Algae, p 99-116. University of California Press, Berkeley and Los Angeles, 1973. 7 fig.

Descriptors: *Cyanophyta, *Structure, *Chemical properties, *Cytological studies, Algae.
Identifiers: *Cell envelopes, Fine structure, Heterocysts, Akinete, Chemical structure.

Cells of prokaryotic organisms are usually enclosed by envelopes. The first envelope external to the cytoplasmic membrane (plasmalemma) is a multilayered structure, the cell wall. Many species have, external to the cell wall, a sheath or capsule which forms a thick and solid outer envelope frequently enclosing several cells, or a thin and dissolving slime layer. In young cross walls both electron-dense layers (L-2) appear to be a single layer. Subsequently the layers are interrupted by a less electron-dense layer, described as the middle lamella. Extracellular mucilage was observed to flow along the surface of trichomes of Oscillatoriaceae and other gliding species. Heterocysts are specialized cells, formed by differentiation of vegetative cells with strong and localized thickenings of the cell wall. The fine structure of the blue-green algal cell wall is similar to that of bacteria. Besides the murein components, carbohydrates, amino acids and fatty acids have been found in cell wall preparations. The mechanism of cell envelope synthesis is probably similar to that e bacterial cell. The mode of division, characteristic of filamentous blue-green algae, begins by an invagination of cytoplasmic membrane and peptidoglycan layer. (See also W74-12562) (Jones-Wisconsin)

CYTOCHEMICAL EXAMINATION OF BLUE-GREEN ALGAE.

New York State Dept. of Health, Albany. Div. of Labs. and Research. G. W. Fuhs.

In: The Biology of Blue-Green Algae, p 117-143. University of California Press, Berkeley and Los Angeles, 1973. 27 fig.

Descriptors: *Cytological studies, *Cyanophyta, *Analytical techniques, Biochemistry, Microscopy, Electron microscopy, Algae. Identifiers: *Cytochemistry, Autoradiography.

Techniques that have been used successfully in cytochemical examinations of blue-green algae are discussed. An interference microscope translates in an unequivocal manner differences in optical lightpaths as large as several wavelengths into shades of brightness and color, and with compensators and micrometers permits quantitative measurement of refractive index and dry mass content. Gelatinous Cyanophycean sheaths of a polysaccharide nature are best stained with ruthenium red or basic dyes. Cytochemical techniques for the demonstration of nuclear material in Cyanophyceae are identical with Light-microscopic techniques, electron-microscopic, and DNA autoradiography are used. Ribonucleic acid and ribonucleoprotein account for the cytoplasmic basophilia in the blue-green algae, as demonstrated with light-microscopy. Cyanophyceae form a storage carbohydrate which is a polymer of glucose with a degree of branching between glycogen and amylopectin. Cytochemically this compound resembles glycogen. Polyphosphate granules (also known as metachromatin, metachromatic granules, or volutin) are concretions of linear polyphosphates of high molecular weight demonstrated by light-microscopy and electron-microscopy. The electron-microscopic identification of cyanophycin has been particularly problematic. The light-microscopic reactions of cyanophycin also show some resemblance to those given by bacterial plasmalemmosomes. (See also W74-12562) (Jones-Wisconsin) W74-12568

LIPID COMPOSITION AND METABOLISM,

Unilever Ltd., Sharnbrook (England). Unilever Research Lab. R W Nichols

B. W. Nichols In: The Biology of Blue-Green Algae, p 144-161. University of California Press, Berkeley and Los Angeles, 1973. 5 fig, 5 tab.

Descriptors: *Chemical properties, *Lipids, *Metabolism, *Cyanophyta, Phylogeny, Plant morphology, Pigments, Cytological studies, Algae. Identifiers: *Fatty acids, Hydrocarbons, Sterols, Poly-beta-hydroxybutyrate, Fatty alcohols, Chemical structure

The intermediary position held by blue-green algae in the evolution of prokaryotic and eukaryotic or-ganisms is reflected in their unique lipid and fatty acid compositions. Although all higher algae contain numerous classes of phosphoglycerides as well as glycosyldiglycerides, the blue-green algae usually contain only one quantitatively important phospholipid and three glycolipids. Certain bluegreen algae usually contain only one quantitatively important phospholipid and three glycolipids. Certain blue-green algae are not unlike many bacteria not only in regard to general cellular morphology but also with respect to fatty acid synthesizing capacity. Existing data for the levels of the tocopherols in the blue-green algae indicate some relationship between the oxidizability of mem-brane fatty acids and the corresponding cellular tocopherol levels. With a single exception, bluegreen algae resemble eukaryotic plants in accumulating plastoquinone A, vitamin K-1 and alphatocopherylquinone within the photosynthetic ap-paratus. Acyl lipids apart, pigments consitute the quantitatively major part of lipid extracts from

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blue-green algae. Heterocysts contain substantial quantities of monohexoside derivatives of long-chain polyhydroxy alcohols. Sterols may prove far more widely distributed than was originally be-lieved. The compositional data so far accumulated for the lipid constituents of individual blue-green algae underline the dangers of correlating molecular complexity with evolutionary status. (See also W74-12562) (Jones-Wisconsin) W74-12569

BILIPROTEINS AND BILE PIGMENTS,

Chicago Univ., Illinois. Dept. of Biology D. J. Chapman.

In: The Biology of Blue-Green Algae, p 162-185. University of California Press, Berkeley and Los Angeles, 1973. 4 fig, 4 tab.

Descriptors: *Pigments, *Proteins, *Cyanophyta, Biochemistry, Amino acids, Rhodophyta, Cytological studies, Synthesis, Phylogeny, Algae.

Identifiers: *Biliproteins, *Bile pigments. Biosynthesis, Chemical structure.

Biliproteins are the red and blue bile pigmentprotein conjugates of the blue-green, red and cryptomonad algae. They consist of non-cyclic tetrapyrrolic bile pigments covalently bound to a protein. The designation bilin or bile pigment is used as the generic name for the tetrapyrrolic chromophore. Thirteen biliproteins are currently known as distinct in vivo entities. Biliproteins usually represent 1-10% of the cell dry weight, although under certain circumstances it may be as much as 24%. Molecular weight, amino acid composition, and aggregation are discussed. It is established that the chromophores are bilins. The structure of in vitro chromophore, the in vivo chromophore and bilin-protein linkage, and billinprotein ratio are given. Evidence suggests there are two distinct chromophore-protein environments that are functionally very important. Phycobilisomes appear to have their own characteristic form. At the molecular level it has been generally accepted that bile pigments in plants and animals are derived by a common pathway and that such a pathway involves the formation and oxidative cleavage of a porphyrin. Results, indicating identity of a complex protein from a prokaryotic and eu-karyotic source, are extremely interesting from the viewpoint of the symbiotic theory of chloroplast origin. (See also W74-12562) (Jones-Wisconsin) W74-12570

STRUCTURE AND FUNCTION OF NUCLEIC

ACIDS, Imperial Imperial Chemical Industries Ltd., Runcorn (England). Corporate Lab., and Liverpool Univ. (England). Dept. of Biochemistry. C. K. Leach, and M. Herdman.

In: The Biology of Blue-Green Algae, p 186-200. University of California Press, Berkeley and Los Angeles, 1973. 1 fig, 3 tab.

Descriptors: *Biochemistry, *Structure, *Organic acids, Cyanophyta, Chemical properties, Cytolog-ical studies, Synthesis, Mode of action, Algae. Identifiers: *Nucleic acids, DNA, RNA, Chloroplasts.

The fine structure, chemical composition and biochemistry of the nucleic acids of blue-green algae are discussed and similarities between these and bacteria nucleic acids and of chloroplasts are compared. Ultrastructural investigations showed their distinction from nuclei of eukaryotes. The nuclear region of Anabaena cylindrica contained fibrils 5 to 7 nm diameter embedded in a matrix of lower electron density. The fibrils were assumed to be DNA by analogy with bacteria and com-parison with stained nuclear areas. The base compositions of DNA from a group of organisms form one criterion by which the group can be classified. Blue-green algae possess mechanisms for main-

tenance and repair of DNA and appear to resemble other organisms in possessing two systems, one in-volving photoreactivation and the other dark repair. This maintenance of DNA, coupled with adequate control of DNA synthesis and accurate segregation of replicated DNA, ensures continuation of species as distinct groups free from major mutagenic changes. The process of ribosome formation and the regulation of their synthesis in the blue-green algae remain unstudied. Their distribution, size, and RNA composition are described. Transcription of DNA into RNA, translation, and nuclease activities are presented. (See also W74-12562) (Jones-Wisconsin) W74-12571

MUTAGENESIS AND GENETIC RECOMBINA-

TION, Texas Univ., Port Aransas, Inst. of Marine Science. C. Van Baalen.

In: The Biology of Blue-Green Algae, p 201-213. University of California Press, Berkeley and Los Angeles, 1973. 1 fig, 3 tab.

Descriptors: Algae, *Cytological studies, *Genetics, *Cyanophyta, Photoreactivation. Identifiers: *Mutagenesis, *Recombination, Mutagenic agents.

The extent to which the nature of the chemical change in DNA leads to mutation, the possible selectivity of certain agents in causing limited spectrum of mutant isolates, and repair processes are operating in blue-green algae and influence the induction and recovery of mutants is only speculative. Much basic information on characterization of suspected mutant forms derived from a parent strain rests upon measurement of growth response changes. The spectrum of proven mutagenic agents is, in comparison with other organisms, limited. Alkylating agents have been used in attempts to produce mutant strains of blue-green algae. Ultraviolet radiation has also been observed to cause mutation. Types of mutants discussed are: antibiotic and drug resistant mutants, morphological mutants, nitrate assimilation mutants, pigment mutants, auxotrophs, mutants with altered ultraviolet light sensitivity, and others. Concerning repair processes, enzyme catalyzed photoreactivation, that is, restoration of biological activity by longer wavelengths than those causing the inactivation has been found. There are only a few observations that may be considered indicative of dark repair. Very little information is available concerning the arrangement of the genetic material. Results suggest that genetic exchange occurs in blue-green algae. (See also W74-12562) (Jones-Wisconsin) W74-12572

PHYCOVIRUSES, Environmental Protection Agency, Cincinnati, Ohio. Virology Section. R. S. Safferman

In: The Biology of Blue-Green Algae, p 214-237. University of California Press, Berkeley and Los Angeles, 1973. 7 fig, 2 tab.

Descriptors: *Viruses, *Cyanophyta, Systematics,

Biocontrol, Algae. Identifiers: *Phycoviruses, Algal viruses.

Attention has been focused on degree of control that phycoviruses may exercise over behavioral patterns of algae. Many morphological and chemical similarities are evident between viruses infecting bacteria and blue-green algae. A system of nomenclature stressing host specificity as its basic criterion was adopted for the algal viruses. Those algal viruses specifically infecting the Cyanophyta are classified under the common name blue-green algal virus (BGAV). Isolation of the LPP-1 virus led to the first serious attempt to use disease-causing agents in controlling algal populations. Apart from their algicidal application, it has been suggested that BGA viruses be used for assessing the efficiency of enteric virus removal in waste treat-ment processes. LPP-1 viruses are discussed under properties of the virus and its hosts, occurrence and distribution, effects of physical and chemical agents on the virus, characteristics of the viral nucleic acid and protein, replication cycle of the virus, interaction of radiations with the virusthe virus, interaction of radiations with the virus-host system, and the virial DNA replication. LPP-2 viruses, SM-1 virus, N-1 and AS-1 viruses, miscel-laneous BGA viruses, and temperate BGA viruses are considered. (See also W74-12562) (Jones-Wisconsin) W74-12573

THE HETEROCYST,

Westfield Coll., London (England). Dept. of Botany. P. Fav.

In: The Biology of Blue-Green Algae, p 238-259. University of California Press, Berkeley and Los Angeles, 1973. 7 fig, 2 tab.

Descriptors: *Cytological studies. *Cyanophyta, Plant morphology, Structure, Nitrogen fixation, Plant physiology, Biochemistry, Algae. Identifiers: *Heterocysts.

Characteristic features of heterocysts are rounded shape and relatively large size, partial separation from the neighboring vegetative cells by constric-tion, presence of conspicuous, thick surrounding envelope except at polar region, seemingly homogeneous cell content due to absence of cytoplasmic granular inclusions, presence near the attachment to the vegetative cell of strongly refractive structures called 'polar nodules', or 'polar thickenings', and a rather yellowish-green appearance. Heterocysts are produced during active growth of the blue-green alga. There is an indication of involvement of heterocysts in nitrogen fixation yet it neither necessitates nor excludes the assumption that nitrogenase is present in the vegetative cells. Some relationship between heterocysts and spores is characteristic of many blue-green algae. In Anabaena species heterocysts one-green agae. In Anabaena species neterocysts are frequently flanked by spores, and sporulation normally progresses from here from one vegetative cell to another. A theory that heterocysts function as storage organs was rejected as no storage products could be demonstrated. The latest hypothesis that heterocysts are involved in nitrogen fixation and may be the actual sites of effective nitrogenase activity provides a major metabolic role for these structures and is in accord with much of the knowledge of heterocyst occur-rence and physiology. (See also W74-12562) (Jones-Wisconsin) W74-12574

NITROGEN FIXATION,

Dundee Univ. (Scotland). Dept. of Biological Sciences. W. D. P. Stewart.

In: The Biology of Blue-Green Algae, p 260-278. University of California Press, Berkeley and Los

Descriptors: *Nitrogen fixation, *Cyanophyta, Plant physiology, Measurement, Cytological stu-dies, Enzymes, Photosynthesis, Algae. Identifiers: Nitrogenase activity, ATP.

There are more genera of blue-green algae known to fix nitrogen than there are of heterotrophic and photosynthetic bacteria combined. Heterocystous species are the most common forms of nitrogenfixing algae. There is also evidence of nitrogen fixation by pure cultures of unicellular blue-green algae and by non-heterocystous filamentous algae. The requirements for in vitro nitrogenase activity are similar to those of nitrogenases from other plant groups in that a reductant and a source of are essential. There are two main approaches to the elucidation of endogenous reductant sources in blue-green algae, one using cell-free ex-

tracts, and the other using whole cells. The specific function of ATP in the process is uncertain. Use of the acetylene reduction technique provides means whereby reductant and ATP require ments can be studied in short-term experiments without complications of a requirement for carbon skeletons to accept the fixed nitrogen. Blue-green algae are alone among nitrogen-fixing organisms in that they evolve oxygen during photosynthesis. It is proposed on the basis of these findings that in heterocystous algae, in air, perhaps an active nitrogenase occurs only in the heterocysts but that under anaerobic conditions both heterocysts and vegetative cells have an active enzyme. (See also W74-12562) (Jones-Wisconsin) W74-12575

PHOTOMORPHOGENESIS AND NOSTOCACEAN DEVELOPMENT, State Univ. of New York, Binghamton. Dept. of

Biological Sciences. N. Lazaroff.

In: The Biology of Blue-Green Algae, p 279-319. University of California Press, Berkeley and Los Angeles, 1973. 15 fig, 3 tab.

Descriptors: *Cyanophyta, *Cytological studies, *Nostoc, *Reproduction, Light, Evolution, Pigments, Life cycles, Plant morphology, Algae. Identifiers: *Photomorphogenesis, Development stages, Polymorphism, Pleomorphism, Horpmorphism, Letterceuter. stages, Polymorphismogonia, Heterocysts.

The work which established present basis for classification of heterocystous organisms mentioned nostocacean polymorphism and referred to possible influence of the natural environment on the succession of forms observed. Pleomorphic phenomena were frequently noted as responses to imposed alternations of physical and chemical en-vironments of developing pure cultures. Dark growth and photoinduction and photoreversal of development are described. Some hypothetical models for photocontrol of development and pigment synthesis in cyanophycean cells are presented under spectral dependence, pigment synthesis, and developmental control. The release of hormogonia is affected by endogenous factors produced by growing thalli as well as by incident light quality. As a consequence of prolonged filamentous growth, cultures containing glucose display a woolly amorphous macrostructure, termed the 'lanose' macromorphology. The factors which influence direction of hormogonial migration, or the formation of motile aggregates of Nostocaceae trichomes are not understood. Light requirements and effects of inhibitors on migration of hor-mogonia are discussed. The factors controlling development of the Nostocaceae operate on a basic cycle of morphological change. Prolongation of a particular stage can result in variations of morphology within that stage following an altera-tion in some intrinsic interaction. (See also W74-12562) (Jones-Wisconsin) W74-12576

MOVEMENTS,

Oregon Univ., Eugene. Dept. of Biology. R. W. Castenholz.

In: The Biology of Blue-Green Algae, p 320-339. University of California Press, Berkeley and Los Angeles, 1973. 5 fig.

Descriptors: *Movement, *Cyanophyta, Light in-tensity, Light quality, Velocity, Environmental effects. Algae.

Identifiers: Gliding behavior, Motility mechanism, Oriented movements, Phototaxis.

Motility in blue-green algae is by gliding. Relatively slow gliding progress is accompanied in some species by rotation of the trichome along its axis. Any point on the trichome will trace either a right-handed or left-handed helix, species specific and noninterchangeable. Gliding velocity is dependent on numerous environmental factors including light intensity, light quality, temperature, pH, and medium viscosity. Availability of phosphate bond energy is the most immediate determinant. Utilization rate of ATP in gliding, as in other enzymatic processes, is temperature dependent. Full motility is immediately light dependent in some species of cyanophytes but coupled almost completely to cyanophytes but coupled aimost completely to respiratory energy production in others (Oscillatoria princeps). The current proposal for Oscillatoria is that numerous microfibrils strung uninterrupted in helices around exterior portion of trichome are the propulsive organelles which move the cell chain against an elastic sheath or other suitable substrate by rapid succession of unidirectional waves. Phototaxis is the only tactic response that has received much attention. Phototopotaxis is orientation and movement toward or away from incident light. Photo-phobotaxis is reversal of movement direction following a sudden change from high to low light intensity or vice versa. (See also W74-12562) (Jones-Wisconsin)

GAS VACUOLES, Westfield Coll., London (England). Dept. of Botany. A. E. Walsby.

A. E. Walsby.
In: The Biology of Blue-Green Algae, p 340-352.
University of California Press, Berkeley and Los
Angeles, 1973. 3 fig.

Descriptors: *Cytological studies, Cyanophyta, Structure, Mode of action, Algae.
Identifiers: *Gas vacuoles, Fine structure, Buovancy.

Electron microscopy showed that gas vacuoles of blue-green algae are made up of stacks of mem-branous, hollow subunits. These gas vesicles retain their characteristic cylindrical appearance when they are isolated from algal cells is not subjected to pressure to cause their collapse. Metal shadowing and negative staining of isolated gas vesicles both reveal that the outer surfaces of the cylindrical structures have a striated topography. Chemical analyses have confirmed the proposition suggested by electron microscopy, that the gas vesicle membrane is fundamentally different from typical unit membranes. Chemical analysis of high typica unit memoranes. Chemica analysis of night purity preparations has demonstrated that protein is the major, and probably the only component. It has been postulated that gas vesicles might have arisen from over-production of protein by ancestral viral infections. The pressure of gas inside the vacuoles is usually at about one atmosphere, much lower than would exist in bubbles of a comparable lower than would exist in bubbles of a comparable size. By estimating the percentage area occupied by gas vesicles in thin sections of Anabaena flosaquae cells, it was established that the gas vacuole content increased as cultures aged. Of the three functions that gas vacuoles might fulfil, that of storing gas is no longer tenable. The two other functions provide light shielding and buoyancy. (See also W74-12562) (Jones-Wisconsin) W74-12578

FRESHWATER PLANKTON,

Durham Univ. (England). Dept. of Botany. B. A. Whitton.

In: The Biology of Blue-Green Algae, p 353-367. University of California Press, Berkeley and Los Angeles, 1973. 1 tab.

Descriptors: *Cyanophyta. *Freshwater. Descriptors: "Cyanophyta, "Freshwater, *Plankton, Eutrophication, Plant morphology, Plant physiology, Ecology, Nitrogen, Phosphorus, Anabaena, Reproduction, Algicides, Inhibition, Tropical regions, Temperate, Competition, Algae. Identifiers: Aphanizomenon, Oscillatoria, Quin-

Ecological literature on planktonic blue-green algae is concerned largely with only about twenty species, those which sometimes form populations dense enough to be termed waterblooms. Of the features widespread among bloom-forming spe-

cies, the most obvious shown by nearly all such blue-green algae is the possession of gas vacuoles. Sensitivity to toxic substances, for example 2.3-DNQ, is found among bloom-forming species. There is also evidence that blue-green algae capable of forming blooms are more sensitive to copper than many other blue-green species. In the presence of dense blue-green algae blooms, algae belonging to other phyla are usually present only in low densities; at the same time the blue-green algal components of the bloom usually consist of only a few species, often with one overwhelmingly dominant. One obvious factor which will lead to selection for particular species is the availability of combined nitrogen. There have also been observa-tions which indicate differences in the ability of bloom-forming species to use different phosphorus sources and levels. Depth of the water, occurrence of planktonic forms, spore formation, effect of temperature are all considered. Studies on planktonic species in individual genera include Aphanizomenon, Anabaena and Oscilla-toria. (See also W74-12562) (Jones-Wisconsin) W74-12579

PHYSIOLOGY AND ECOLOGY OF MARINE BLUE-GREEN ALGAE, University Coll. of North Wales, Bayer. Marine

Science Lab.

G. E. Fogg. In: The Biology of Blue-Green Algae, p 368-378. University of California Press, Berkeley and Los Angeles, 1973.

Descriptors: *Marine algae, *Distribution, *Cyanophyta, Plant physiology, Ecology, Littoral, Sands, Rocks, Shores, Salt marshes, Mangrove swamps, Plankton, Algae.

Marine representatives of Cyanophyceae have some distinct features, including their nitrogen-fixing activities. The littoral fringe is delineated below by upper barnacle limit and its upper part is characterized by lichens, Verrucaria and Lichina. Free-living blue-green algae, belonging predomi-nantly to genera Calothrix, Phormidium, Gloeocapsa, Nodularia and Rivularia, occur as a black encrusting film on rocky shores. Sand which remains undisturbed sufficiently long develops a blue-green community. In salt marshes and mangrove swamps, many species are the same as found on rocky shores, e.g., Calothrix scopu-lorum, Rivularia atra, Lyngbya aestuarii, Hydrocoleum lyngbyaceum and Phormidium tenue. Calothrix confervicola and Symploca hydnoides are recorded between low water mark and 5 m below this level and Lyngbya majuscula down to 30 m below low tide level in the Ria de Arosa. The tendency of Cyanophyceae to become symbiotic is manifested in the sublittoral. The exacting requirements of sublittoral forms contrast with the tolerance to variations in salinity noted for intertidal blue-green algae and suggests the existence of tidal blue-green algae and suggests the existence of ecologically selected strains. The blue-green algae appearing in the marine plankton belong mainly to the genera Oscillatoria, Trichodesmium, Pelagothrix, Haliarachne and Katagnymene. Nostoc and a Daetylococcopsis have been reported from deep water. (See also W74-12562) (Jones-Wisconsin) W74-12562) W74-12580

ECOLOGY OF BLUE-GREEN ALGAE IN HOT

SPRINGS, Oregon Univ., Eugene. Dept. of Biology. R. W. Castenholz. In: The Biology of Blue-Green Algae, p 379-414, University of California Press, Berkeley and Los Angeles, 1973. 9 fig.

Descriptors: *Ecology, *Cyanophyta, *Hot springs, Oregon, Chemical properties, Temperature, Hydrogen ion concentration, Nitrogen fixa-

Identifiers: *Thermophilic blue-green algae, Yel-lowstone National Park, Synechococcus lividus,

Group 5C-Effects Of Pollution

Oscillatoris terebriformis, Mastigocladus, Thermal ecology, Algae.

The subject of thermal ecology as applied to cyanophytes raises the question of whether a thermal tendency in blue-green algae may be expected because of some basic feature of their prokaryote cells. Cyanophytes occur in almost every illuminated hot spring above a pH of 5 and below 74C in western North America or below 64C in much of the rest of the world, unless there are extreme concentrations of certain solutes. In the Oregon hot springs, the unusually high temperature minimum for Synechococcus mat development is probably determined by the other competitive cyanophyte at that temperature, Oscillatoria terebriformis. In the Yellowstone springs, most work on cyanophyte mats was concentrated on a few alkaline sodium, chlorine bicarbonate springs Many Yellowstone hot springs mats have the ability to fix nitrogen. One of the unique features of thermal biosystems is that few, if any, identical as-semblages of microorganisms can be found on a global scale even when the physicochemical en-vironment appears similar. The distribution of Synechococcus lividus, of Oscillatoria terebriformis, and of Mastigocladus are given. Sulphide appears the most common of chemical variables in hot springs that influence species composition. (See also W74-12562) (Jones-Wisconsin) W74-12581

INTERACTIONS WITH OTHER ORGANISMS, Durham Univ. (England). Dept. of Botany

In: The Biology of Blue-Green Algae, p 415-433, University of California Press, Berkeley and Los Angeles, 1973. 2 fig.

*Cyanophyta, Descriptors: "Cyanophyta, "Bacteria, *Symbiosis, Protozoa, Fungi, Algae, Carbon diox-ide, Viruses, Habitats, Myxobacteria, Algicides, Inhibition, Epiphytology, Infection, Parasitism, Hosts, Lichens, Mosses, Nitrogen fixation. Identifiers: Prokaryotes, Eukaryotes, Photosynthetic organisms, Multicellular animals, Antagonistic effects, Lytic bacteria, Phycobionts.

Blue-green algae occurring in a wide range of habitats influence, or are influenced by the behavior of a wide range of other organisms. Only two aspects have been studied closely: the lytic effec! of certain organisms, especially myxobacteria, and the possible importance of bacteria in raising the carbon dioxide level. That organisms from many different taxa have at times a marked influence on behavior of blue-green algal populations is clear, for instance, bacteria, protozoa, fungi and viruses have all been shown to destruct local planktonic populations. It is still impossible to evaluate the relative importance of the various antagonistic agents in nature. The problems are to what extent different agents are more important in different habitats, and to what extent are their antagonistic effects influenced by the physiological conditions of the algal population. The answers are of obvious significance in situations where it is desired either to increase or decrease algal growth. Of many examples known of marked interactions between blue-green algae and eukaryotic organisms-protozoa fungi, photosynthetic organisms and multicellular animals-are the wide range of symbiotic associations. (See also W74-12562) (Jones-Wisconsin) W74-12582

THE RELATIONSHIP BETWEEN BLUE-GREEN ALGAE AND CARBONATE DEPOSITS, Boston Univ., Mass. Dept. of Biology.

In: The Biology of Blue-Green Algae, p 434-472, University of California Press, Berkeley and Los Angeles, 1973. 19 fig.

Descriptors: *Cyanophyta, *Aggradation, *Carbonates. Sedimentology. Calcium carbonate, Marine geology, Freshwater, Geologic history, Carbonate rocks, Sedimentary rocks, Travertine, Algae.
Identifiers: Concretions, Oncolites, Algal stro-

matolites, Algal mats

The relationship between cyanophytes and car-bonates has attracted scientific attention for a long time, both in the geological and biological sciences. Fossil sedimentary structures found in carbonate rocks have been attributed to the activi-ty of cyanophytes. The critical factor in the equilibrium is the amount of dissolved gaseous carbon dioxide in the system which depends upon the partial pressure of carbon dioxide in the atmosphere above the solution. Once precipitated from solution, calcium carbonate can either crystallize directly and form a sediment in the immediate environment, or it can be transported to form sediment elsewhere. Hence the calcium carbonate found in the thalli of benthic cyanophytes does not necessarily come exclusively from their own biogenic precipitation. Carbonate encrustation and its use in cyanophyte taxonomy depends upon degree of variability of encrustation within a species under different environmental conditions, and degree of convergency between different species under encrusting conditions. Marine car-bonate precipitation and sediment formation in the marine coastal environment are discussed. Fossil stromatolitic structures occur throughout the entire geological column from the early Precambrian to the Recent. The disintegration of carbonate substrates by algae and fungi are reported. (See also W74-12562) (Jones-Wisconsin) W74-12583

STATUS OF CLASSICAL TAXONOMY,

Madras Univ. (India). Botany Lab.

T. V. Desikachary.

In: The Biology of Blue-Green Algae, p 473-481, University of California Press, Berkeley and Los Angeles, 1973.

Descriptors: *Cyanophyta, *Systematics, Evolution, Algae. Identifiers: Chroococcales, Filamentous bluegreen algae

Phycological problems of blue-green algal classifireprotogral proteins of olde-green again classifi-cation are generated by the classical taxonomy of their 150 genera and about 1500 species. Two broad categories are easily distinguishable, the coccoid (Chroococcales) and the filamentous forms. The latter are characterized by short pieces of trichomes which serve as reproductive bodies, the hormogonia. Refinement of the classification of the filamentous forms has resulted in separation of two (or more) orders, Nostocales and Stigonematales. Two other groups, sometimes treated as separate orders, the Chamaesiphonales and the Dermocarpales, include forms which exhibit polarity. The Stigonematales, can be distinguished from the other hormogonalean members (Nostocales) by the occurrence of true branches and the heterotrichous habit. In the sequential arrangement of the orders and families two systems are known, one followed by those who believe in the progressive evolution of the blue-greens from Oscillatoria-like plants to Stigonema-like ones and the other by those who believe that the reverse has taken place in a retrogressive evolution. Almost all agree that the coccoid forms are primitive, and they are generally placed at the very beginning of the whole group. (See also W74-12562) (Jones-Wisconsin) W74-12584

PROSPECTS FOR TAXONOMIC DEVELOP-

Ceskoslovenska Akademie Ved, Trebon. Inst. of Microbiology.

J. Komarek In: The Biology of Blue-Green Algae, p 482-486, University of California Press, Berkeley and Los Angeles, 1973. Descriptors: *Systematics, *Cyanophyta, Mathematical studies, Plant morphology, Plant physiology, Algae. Identifiers: Numerical taxonomy

Potentialities for using numerical methods in helping to clarify the muddled situation in blue-green alga taxonomy is presented. Classical taxonomy, with its underlying evolutionary assumptions, uses the monothetic principle of classification, as all the characters of subordinate taxa must necessarily be included in the definition of a superior taxon.
The procedures of numerical classification involve the polythetic formation of taxonomic groups, without any preliminary definition of the distinguishing features characterizing the superior taxon. The taxa are defined by means of sets of input characters. Results of this procedure do not necessarily substantially differ from those ob-tained by the traditional methods. Use of numerical taxonomy does not exclude the necessity for observing the Code of Botanical Nomenclature. Any modern taxonomic revision requires data of at least two different types (e.g. morphological and physiological) combined with several different methodological approaches. Numerical evaluation requires as comprehensive a set of characters as possible, in contrast to the traditional system, which usually cannot make efficient use of all the accumulated morphological data. Although numerical methods in revising blue-green algae classification are stressed, numerous systems should be tried on smaller taxonomic units. (See also W74-12562) (Jones-Wisconsin) W74-12585

EVOLUTIONARY ECOLOGICAL AND ASPECTS OF THE CYANOPHYTES, Wisconsin Univ., Madison. Dept. of Bacteriology.

In: The Biology of Blue-Green Algae, p 487-500, University of California Press, Berkeley and Los Angeles, 1973. 9 fig.

Descriptors: *Evolution, *Ecology, *Cyanophyta, Stratigraphy, History, Pigments, Anaerobic condi-tions, Thermal springs, Nitrogen fixation, Hydrogen ion concentration, Algae. Identifiers: *Identification.

The cyanophytes are members of the prokaryotic group which contain chlorophyll-a and a phycobilin and which evolve oxygen by photosynthesis. The distinction from eukaryotic algae is usually made on the basis of general lack of intracellular differentiation in cyanophytes. If the cyanophyte has a cell diameter greater than 2.0 micrometers it nas a ceit diameter greater than 2.0 micrometers it can usually be distinguished from other proka-ryotes; the difficulty arises when their cell diame-ters are less than 1.0 micrometer. Certainly the cyanophytes were the first oxygen-producing photosynthetic organisms, and they were probably photosynthetic organisms, and they were probably responsible for a marked increase in the atmospheric oxygen concentration during the Precambrian period. Some cyanophytes are able to grow anaerobically, a property not normally associated with eukaryotic algae. Cyanophytes are the exclusive oxygen-evolving photosynthetic organisms in thermal springs, and are the only group of oxygen-evolving photosynthetic organisms. of oxygen-evolving photosynthetic organisms which fix nitrogen. Their gas vacuoles permit upward movement in the water column from lower depths. The ability to live anaerobically may be a property retained by this group since their initial evolution in the Precambrian, providing them with a selective advantage over eukaryotic algae in certain habitats. (See also W74-12562) (Jones-Wiscontage) sin) W74-12586

AUTOTROPHY AND HETEROTROPHY IN UNICELLULAR BLUE-GREEN ALGAE,

Institut Pasteur, Paris (France).

In: The Biology of Blue-Green Algae, p 501-518, University of California Press, Berkeley and Los Angeles, 1973. 6 fig, 8 tab.

Effects Of Pollution—Group 5C

*Metabolism. *Cyanophyta, Descriptors: *Nutrient requirements, Enzymes, Biochemistry. *Nutrient required:
Carbon, Algae.
Identifiers: *Autotrophy, *Heterousphy,
Chemoheterotrophy,
-booccus 6301, Photoheterotrophy, Chemoheterotrophy Aphanocapsa 6714, Synechococcus 630 Aphanocapsa 6308, Unicellular blue-green algae.

All blue-green algae examined use light as an energy source and carbon dioxide as a carbon source, their dominant nutritional mode being photoautotrophy. Like other autotrophs, blue-green algae can take up organic compounds. Probably all bluegreen algae can perform a light-dependent as-similation of organic substrates, such as acetate and amino acids. Many blue-green algae appear to be obligate photographs; the range of organic compounds able to support growth of facultative chemoheterotrophs is remarkably narrow--confined to glucose, fructose and one or two dis-accharides. Data strongly suggests that growth of facultatively heterotrophic strains in dark is much slower than growth in light implying that rate of ATP synthesis by non-photochemical means is always far less than the rate of ATP synthesis by photophosphorylation. The range of organic compnotopnospnorylation. The range of organic com-pounds that support dark growth is so narrow because the pentose phosphate pathway is the sole energy-yielding dissimilatory pathway. If some blue-green algae can grow with sugars in the dark, why cannot all members of the group do so. The barrier seems to lie in one (or both) of the steps required to convert exogenous glucose to glucose-6-phosphate, mediated by glucose permease and hexokinase. (See also W74-12562) (Jones-Wisconsin) W74-12587

CULTURE COLLECTIONS. APPENDIX A,

Ceskoslovenska Akademie Ved, Trebon. Inst. of Microbiology.

In: The Biology of Blue-Green Algae, p 519-524, University of California Press, Berkeley and Los Angeles, 1973.

Descriptors: *Algae, *Cultures, *Laboratories, Foreign countries, Canada, United States, Foreign co Cyanophyta. Identifiers: *Culture collections.

Laboratories which maintain culture collections of algae in Canada, Czechoslovakia, the Federal Republic Germany, France, German Democratic Republic, Great Britain, India, Japan, Switzer-land, United States, and the Soviet Union are listed. Details are given under each specific laboratory. Investigators are advised to carefully examine all cultures for contaminants, including nonlisted species of blue-green algae. (See also W74-12562) (Auen-Wisconsin)

NOTES ON ISOLATION AND LABORATORY CULTURE. APPENDIX B.

Liverpool Univ. (England). Dept. of Biochemistry. N. G. Carr, J. Komarek, and B. A. Whitton. In: The Biology of Blue-Green Algae, p 525-530, University of California Press, Berkeley and Los Angeles, 1973. 4 tab.

Descriptors: *Algae, *Cultures, *Cyanophyta, Laboratory tests, Methodology.

A selection of experimental procedures known to be effective for the isolation and laboratory cul-ture of blue-green algae is presented. Several techniques, some involving the specific resistance to agents toxic to many bacteria or fungi, are listed. The use of non-mutagenic antibiotics is increasing and cycloheximide (actidione) is of particular value in inhibiting many eukaryotic con-taminants. Detailed descriptions of the effects of particular antibiotics are summarized. Many species may be conveniently maintained in liquid culture or on agar slopes of mineral salts, the latter

often preferable. Blue-green algae, unlike many other prokaryotes, should not be maintained in a refrigerator. Exponential growth may be achieved for several algal species and the culture media employed for some are described. Blue-green algae are sometimes very fastidious and the use, for all media, of double-glass distilled water is recom-mended. (See also W74-12562) (Auen-Wisconsin)

CONTINUOUS CULTURE OF FILAMENTOUS BLUE-GREEN ALGAE. APPENDIX C, Bhabha Atomic Research Centre, Bombay (India).

Biology and Agriculture Div.

In: The Biology of Blue-Green Algae, p 531-535, University of California Press, Berkeley and Los Angeles, 1973. 4 fig.

Descriptors: *Algae, *Cyanophyta, *Cultures, Methodology, Laboratory tests, Analytical Identifiers: *Continuous culture, Chemostat.

Details of the working and control of the chemostat which has been found to give satisfactory steady-state performance for filamentous photosynthetic microorganisms such as Anabaena are reported. Briefly, continuous culture entails growing the microorganism in submerged culture with continuous addition of the medium at a specified rate while simultaneously harvesting the microbial suspension at a similar rate thus keeping the culture volume constant. By changing the dilution rate, different rates of growth are obtained. Maintaining a given dilution rate will soon result in a steady-state culture with physiological characteristics typical of the prevailing growth rate. The limiting factor is usually light intensity in photosynthetic microorganisms because the mean effective light intensity on the cell or on unit biomass is directly related to the dilution rate. The chemostat offers the advantages that the suspen-sion depth (and thus the volume of suspension) can be changed in steps of 5 cm and chemostatic overflow ensured at any of the depths. Temperature is controlled without the use of cumbersome water baths. The provision for unilateral light facilitates direct assessment of light energy utilization by comparing incident light at the base of the cylinder and transmitted light measured just above the suspension. (See also W74-12562) (Auen-W74-12590

MASS CULTIVATION OF ANACYSTIS NIDU-

LANS. APPENDIX D,
Tuebingen Univ. (West Germany). Institut fur Chemische Pflanzenphysiologie. F. Juttner.

In: The Biology of Blue-Green Algae, p 536-539, University of California Press, Berkeley and Los Angeles, 1973. 1 fig.

Descriptors: *Algae, *Cultures, *Cyanophyta, Cytological studies, Laboratory tests, Methodolo-

gy. Identifiers: *Mass culture, Anacystis nidulans.

A laboratory technique to produce a sufficient number of cells of Anacystis nidulans and the construction of a large-scale culture unit that can easiproduce kilogram amounts of algae is described in detail. It is based on the principle for algae cultivation of an open air pilot plant. Only inert materials like borosilicate glass and PTFE were used to prevent a negative influence of solved material on the algal growth. Besides Anacystis a great number of other algae from different classes as well as photosynthetic bacteria could be successfully grown in this culture unit. (See also W74-12562) (Auen-Wisconsin) W74-12591

EFFECTS OF TOXAPHENE CONTAMINATION

ON ESTUARINE ECOLOGY,
Georgia Univ., Sapelo Island. Marine Inst.
R. J. Reimold, P. C. Adams, and C. J. Durant. Available from the National Technical Informa-Available Holm the National Technical Information Service, Springfield, Va 22161 as COM-74-10408; \$4.50 in paper copy, \$2.25 in microfiche. Georgia Marine Science Center, Skidaway Island, Technical Report Series No 73-8, September 1973. 100 p, 19 fig, 34 tab, 9 ref.

Descriptors: *Water pollution effects, *Estuaries, *Ecology, Sampling, Salt marshes, Georgia, Aquatic plants, Sediments, Statistical methods, Aquatic animals, Chlorinated hydrocarbon pesticides, Systematics.
Identifiers: *Toxaphene, Diversity index, Duplin

Estuary(Ga), Sapelo Island(Ga).

The stream effluent from a toxaphene manufacturing plant drained directly into a tidal stream adjacent to Sapelo Island, Georgia, had released significant toxaphene in its effluent for the past two decades so that a shellfish pesticide monitoring program detected high levels of toxaphene in shellfish ten miles downstream. Samples of fauna, flora, sediment, and water were analyzed for tox-aphene content. The major study area was a salt marsh watershed on the southeastern coast of Georgia. Purpose of the research was to quantify otential effects of toxaphene effluent on the estuarine fauna and flora and monitor quantitative changes in the ecosystem that might be associated with a toxaphene pollution abatement program. Ecological comparisons based on species diversity indices were made between this contaminated system and a pristine area. Computations of species diversity indices were completed using an IBM 360-65 computer. As the toxaphene content in the plant effluent decreased during the three year study period, the toxaphene content of fauna, flora and sediments also decreased. Concurrent with this was a significant increase in species diversity of the Brunswick marsh area, especially Terry Creek. (Jones-Wisconsin) W74-12592

ROLE OF ALGAL AND FUNGAL POLYSACCHARIDES IN THE FORMATION AND HYDROLYSIS OF LAKE SEDIMENTS,

Ohio State Univ., Columbus. Dept. of Microbiolo-

V. Sangar, and P. R. Dugan. Available from the National Technical Informa-tion Service, Springfield, Va. 22161 as PB-236 177, tion service, springited, va. 22161 as 76-250 ft. \$3.25 in paper copy, \$2.25 in microfiche. Ohio Water Resources Center Project Completion Re-port No 394X, September 1973. 37 p, 2 fig, 12 tab, 59 ref. OWRT A-024-OHIO(1).

Descriptors: *Organic compounds, *Hydrolysis, *Carbohydrates, *Lake sediments, Cyanophyta, Algae, Fungi, Eutrophication, Lake Erie, Algae, Fungi, Eutrophication, Lake Elle, Nitrogen, Lipids. Identifiers: *Polysaccharides, Anacystis nidulans,

Alternaria tenuis, Smittium culisetae.

Evidence indicates that extracellular bacterial polymers contribute significantly to sedimenta-tion, representing an oxygen demand. The role of non-bacterial microorganisms such as algae and fungi in producing extracellular polymer is discussed. Because of the potential significance during algal blooms in Lake Erie, studies were conducted to determine extent and composition of polysaccharides produced by Anacystis nidulans and to determine what nutritional factors might influence cell and polymer production. Cell walls of Smittium culisetae were isolated by mechanical means and a quantitative and qualitative study was made. Lipid composition of an Alternaria was also studied. The relative distribution of major lipid classes of Alternaria tenuis isolated from bottom muds of Lake Erie's western basin are also presented. Both Anacystis nidulans and Alternaria tenuis were cultured on various nitrogen sources to determine effects of nitrogen on growth. It is

Group 5C-Effects Of Pollution

likely that Anacystis, responsible for algal blooms produces soluble polysaccharides which diffuse into the water causing a greater organic en-richment than would be accounted for by many procedures used to measure primary productivity. Examination of Alternaria tenuis lipids showed that almost all the major classes of lipids were present in its mycelium. (Jones-Wisconsin) W74-12656

BACTERIAL CONTROL OF AQUATIC ALGAE, Ohio State Univ., Columbus. Dept. of Microbiolo-

gy. J. C. Burnham.

Available from the National Technical Information Service, Springfield, Va. 22161 as PB-236 185, \$4.00 in paper copy, \$2.25 in microfiche. Ohio Water Resources Center Project Completion Report No 414X, October 1973. 90 p, 16 fig, 1 tab, 6 plates, 92 ref.

Descriptors: *Algal control. *Biocontrol, *Cyanophyta, Parasitism, Mode of action, Laboratory tests, Toxicity, Chemcontrol,

Identifiers: *Bdellovibrio bacteriovorus, Phormidium luridium, Cell lysis, Selenium.

Active bdellovibrio cultures as well as culture supernatants (cell free by centrifugation and filtration) were capable of breaking down Oscillatoria. The disintegration caused by the enzymatic secretions of the bdellovibrios is extensive, resulting in the loss of cytoplasmic cell contents and eventual cell wall dissolution. Four day old cultures of bluegreen algae, Oscillatoria sp. or Phormidium lu-ridum, were interacted with 24 hr. cultures of Bdellovibrio bacteriovorus ATCC no. 15143 in both solid and liquid environments. Phase contrast microscopic examination showed gradual structural changes in both algae species until after 4 days only cell wall fragments remained. When photosynthesis was followed in the mixed culture of Bdellovibrio bacteriovorus and the bacterialfree Phormidium, a total inhibition of oxygen evolution occurred after 36 hours. The inhibition of photosynthesis will be the key to isolation and purification of the lytic factor. Experiments with lytic factor dilutions indicate that 1 bdellovibrio cell is producing enough of the factor to inhibit 75 P. luridium blue-green algae cells. Appendix II describes an improved method of cell enumeration for filamentous algae and bacteria and Appendix III discusses the toxic effects of selenium to blue-green algae. All lebestory test selections are produced to the contraction of the cont green algae. All laboratory tests and results are detailed. (Jones-Wisconsin) W74-12657

THE BEHAVIOR OF PHOSPHATE IN THE IN-TERSTITIAL WATERS OF CHESAPEAKE BAY

SEDIMENTS, Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences. J. T. Bray

Available from the National Technical Information Service, Springfield, Va. 22161 as COO-3292-7, \$10.50 in paper copy, \$2.25 in microfiche. PhD thesis, 1973, 161 p. 28 fig. 13 ab, 114 ref. AEC AT(30-1)3497, AT(11-1)3292, NSF RANN GI-

Descriptors: *Cycling nutrients, *Phosphates, *Connate water, *Chesapeake Bay, Sediments, Maryland, Iron, Mathematical models, Sedimentwater interfaces, Analytical techniques, Distribu-tion, Estuaries, Sampling. Identifiers: Ferrous iron, Vivianite, Apatite.

Determinations of interstitial phosphate concentrations and a number of associated chemical para-menters were made on sediment cores taken along the axis of Chesapeake Bay. The phosphate analysis used is a measure of Soluble Reactive Phosphate, a method sensitive not only to inorganic orthophosphate, but also to some soluble or-ganic phosphate forms and, so some extent, short-

chain polyphosphates. These data were included into a simple equilibrium model. Results indicate that interstitial phosphate concentrations are covarient with the concentrations of dissolved ferrous iron and can be described by equilibrium between pore water and the mineral vivianite. This situation is contrary to the commonly accepted view that phosphate concentrations are controlled through equilibrium with the calcium phosphate minerals, especially the apatite group. Vivianite as a distinct sedimentary mineral phase was demon-strated by x-ray diffraction. The presence of vivianite lends additional support to the results of the equilibrium model. The interstitial waters of Chesapeake Bay sediments are a vast reservoir of dis-solved inorganic phosphate. Estimates of diffusional flux into the overlying water indicate that the relative supply of phosphate to the biomass by this means may be of little significance. (Jones-Wisconsin) W74-12658

A COMPARTMENTED AQUATIC MODEL OF THE RELATIONSHIP BETWEEN CARBONATE AND NITRATE IN A GREAT PLAINS RESER-

Oklahoma State Univ., Stillwater. Dept. of Chemistry; and Oklahoma State Univ., Stillwater. Dept. of Zoology; and Los Alamos Scientific Lab., N. M. L. P. Varga, G. K. Rice, D. W. Toetz, and E. D.

Loughran.

Lougnan. Available from the National Technical Information Service, Springfield, Va. 22161 as CONF-730445-1, \$3.25 in paper copy, \$2.25 in microfiche. Mimeo (undated). 22 p, 9 fig, 2 tab, 12 ref. AEC AT(11-1)-2070 AT(40-1)-4254.

Descriptors: *Mathematical models, *Nitrates, *Carbonates, *Eutrophication, *Algae, Reservoirs, Great Plains, Oklahoma, Cyanophyta Cycling nutrients, Potable water, Actinomycetes, Solar radiation, Temperature, Light intensity, Ammonia, Oxygen, Carbon dioxide, Forecasting, Equations.

Identifiers: Lake Carl Blackwell(Okla).

Evidence is provided for the usefulness of a mathematical model in predicting annual bloom of blue-green algae in Lake Carl Blackwell, a water supply reservoir in Oklahoma. Some advances in the development of automated environmental sensors and a computational model for nitrate uptake are described. Size of the algal bloom may determine the population of actinomycetes which are generally blamed for musty odors in drinking water. A compartmented simulation model was developed in the form of a set of non-linear simultaneous differential equations. Input data used are diel and annual changes in irradiance, nitrate, am-monia, oxygen and carbon dioxide and annual changes in temperature. The maximum uptake rate of nitrate by phytoplankton as a function of light intensity was determined on August 14, 1970 by the N-15 isotopic dilution technique. The total inorganic carbon concentration was corrected for the carbonate tied up as complex ions assuming equilibrium at the surface. Predictions of the time course of the algal blooms made by the model are gratifyingly close to the observed wax and wane of algal populations, considering the limited data base. (Jones-Wisconsin)

CHESAPEAKE BAY NUTRIENT INPUT STUDY, Environmental Protection Agency, Annapolis,

Md. Annapolis Field Office.
V. Guide, and O. Villa, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-228 389, \$10.00 in paper copy, \$2.25 in microfiche. Techni-cal Report 47, September 1972. 141 p, 30 fig. 28 tab. 28 ref.

Descriptors: *Eutrophication, *Chesapeake Bay, Water Tributaries, Nutrients, quality, Watersheds(Basins), Potomac River, Rivers, Seasonal, Maryland, Surveys, Regression analy-

Identifiers: *Nutrient loading, *Nutrient sources, Susquehanna River, Patuxent River, Rappahan-nock River, Mattaponi River, Pamunkey River, Chickahominy River, James River.

An intensive water quality survey of the Chesapeake Bay's major tributary watersheds was conducted to determine the primary sources and relative contribution of nutrients affecting the Chesapeake Bay from nontidal areas. The survey was confined to the following watersheds: Susquehanna, Patuxent, Potomac, Rappahannock, Matna, Patuxent, Potomac, Rappanannock, Mat-taponi, Pamunkey, Chickahominy, and James. The primary sources of nutrients entering the Chesapeake Bay emanate from three major watersheds: Susquehanna, Potomac, and James. Control of nutrients from these major watersheds, especially the Susquehanna, should result in a restored nutrient balance in the Bay. Nutrient concentrations and river discharges showed interesting relationships which were found to be depen-dent on several factors, i.e., particular nutrient within a particular watershed, time of the year, and weather conditions which affected normal river discharge. Most of the water quality problems are similar to those in other comparable areas of the United States but are compounded because the area is largely tidal. Identification of the Susquehanna River as the major contributor to the Chesapeake Bay's nutrient load resulted in the implementation of an intensive nutrient survey within the Susquehanna Basin to locate individual sources and their degree of controllability. (Jones-Wisconsin) W74-12660

AN ENVIRONMENTAL REFERENCE FOR THE

CONSTRUCTION INDUSTRY, Indiana Univ., Bloomington. Poplars Research and Conference Center. P. Grills.

School of Public and Environmental Affairs Report, December 1974, 141 p.

Descriptors: *Environmental effects, *Pollution abatement, *Construction, *Industries, Legislation, Regulation, Economics, Bibliographies, Social aspects, Political aspects, Government finance, Grants, Construction materials, Indiana, Air pollution, Water pollution control, Standards,

Identifiers: *Construction industry, Construction

Many construction operations are conducted on a project site. Usually the adverse effects of these operations can be minimized by assessing each operation for its potential effect on the natural environment, and taking the necessary precautions to prevent unwarranted damage. Federal and state statutes and regulations designed specifically for protection of the natural environment are discussed which deal only with the more salient discussed which deal only with the more salient features of the control scheme most directly affecting the construction industry. Statutory authority for regulatory powers, agencies responsible for administration, pertinent regulations, and the status and progress of future regulations and relative field the design and planning these of consideratified. identified. The design and planning phase of con-struction must be familiar with the technology employed to meet environmental standards, environment impact statements, and necessary environmental permits and licenses. The impact of regula-tion will be determined by the industry's ability to adapt to its changing environment. Many of the more critical regulations, especially for control of runoff from construction sites are not yet promulgated. The industry should assist in developing these regulations by creating a good liaison with controling agencies. Educational programs could be developed. Possible sources for financial and program assistance are listed, and a bibliography is included. (Jones-Wisconsin) W74-12661

Effects Of Pollution—Group 5C

LOST AND LIVING LAKES IN THE UPPER UME VALLEY,

G. Wassen.

Acta Phytogeographica Suecica, Vol 50, p 233-239, 1965. 5 fig.

Descriptors: *Lakes, *Vegetation, *Reservoirs, Shores, Alpine, Water level fluctuations, Algae, Aquatic plants.

Adjustic plants. *Sweden, *Ume River Val-

Sweden, *Ume Gardiken Rese lev(Sweden). Reservoir(Sweden), Ajaure Lake(Sweden), Gautajaure Lake(Sweden), Lake Tarnasjon(Sweden), Lake Stora Umevattnet(Sweden).

The upper course of the Ume River, Sweden was studied, especially its shore vegetation. The woods around Lake Gardiken, a reservoir combining six lakes, are typical of the conifer forests of the prealpine subregion. The prevailing habitat conditions on the shores corresponded to the alpine environment. The most conspicuous zonation and richest in species was the Calluna belt. The adiacent Vaccinium vitis-idaea belt had a number of local preferential species. Through a gigantic dam was under construction in 1965, the two lakes, Ajaure and Gautajaure, will be combined. Drained through an eastern tributary, the remote lake, Tarnasjon, lies in an uninhabited area east of high-alpine summits with small glaciers. In the absence of Calluna, the part of the geolittoral corresponding to the Calluna belt is dominated by Nardus stricta, Cassiope hypnoides, and Vaccinium uliginosum. The source lake of the main river, Lake Stora Umevattnet, was unique for multiplicity in edaphi-cal conditions and floristic richness, notable in cryptograms. Damming this lake in 1965 is one of the great sacrifices forced upon nature by techni-cal development. (Jones-Wisconsin) W74-12662

EFFECTS OF A SULPHATE PULP MILL ON THE BENTHIC MACROFAUNA IN A FIRTH OF THE BOTHNIAN SEA,

Swedish Water and Air Pollution Research Lab., Stockholm.

R. Rosenberg, K. Nilsson, and L. Landner. To be published in 'Merentutki

'Merentutkimuslait. Julk./Havsforskningsinst. Skr, Finland.' January 1974. 11 p. 7 fig. 2 tab. 14 ref.

Descriptors: *Water pollution effects, *Benthic fauna, *Estuaries, *Sulfates, Pulp wastes, Brackish water, Mercury, Dominant organisms, Distribution, Clams, Amphipoda, Oligochaetes, Diptera, Crustaceans.

*Natrafjarden Firth(Bothnia Sea), Identifiers: Sweden, Finland, Pontoporeia affinis, Macoma baltica, Mesidothea entomon.

Study was made of the effect of waste water from a sulphate pulp mill at Kopmanholmen, Sweden on the Natrafjarden Firth on the Gulf of Bothnia on benthic macrofauna. Physical and chemical parameters were determined. The organic wastes were transported in the surface water and oxygen depletion was not observed during the investiga-tive period 1969-72. In August 1972 a total number of 32 stations were sampled in Natrafjarden and one station outside that area. Depths at these stations were between 5 and 57 m and more than 15,000 specimens were collected. No macrofauna was found at the 12 innermost stations of Natrafjarden due to heavy pollution. Four communities were distinguished with respect to depth and pollution. The most frequently found species were Pontoporeia affinis, Macoma baltica and Mesidothea entomon; the latter two were most tolerant to pollution. Faunal comparisons with other polluted areas are discussed. The highest diversity and biomass were found in shallow areas above 20 m in Natrafjarden and off the SW coast of Finland. In contrast, the highest diversity and biomass are generally found at greater depths in more saline waters. (Jones-Wisconsin) PHYTOPLANKTON: GRASS OF THE SEA, Oregon State Univ., Newport. Dept. of Oceanog-

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as COM-74-10454, \$3.00 in paper copy, \$2.25 in microfiche. Marine Advisory Program Sea Grant No. 9, December 1973. 4 p, 6 fig, 5 ref.

Descriptors: *Marine algae, *Food chains, Fish, Phytoplankton, Diatoms, Dinoflagellates, Cyanophyta, Productivity, Water pollution ef-

A murky green or amber appearance in nearshore coastal waters is almost always due to the presence of many small, single-celled plants called phytoplankton. From carbon dioxide and water, by photosynthesis, they produce more organic matter than any other plants and they release amounts of oxygen proportional to the carbon dioxide they use. Without this production, not only would there not be any food for grazing and filter feeding animals in the ocean but there would be no fish, which feed on the smaller grazers. On most westward-facing coastlines in all parts of the world, massive phytoplankton growths, called blooms, occur. Plants comprising phytoplankton are of many different species, all microscopic in size. Usually the most abundant are diatoms. The second most abundant organisms are dinoflagellates. Nearly all of the phytoplankton species are used as food by small invertebrate animals that feed by filtering the water. The total amount of marine food produced depends on the annual rate of production of phytoplankton, the type of organisms we can economically harvest and find edible, and on the number of steps in between. (Jones-W74-12664

FROM LAKES IN NORTHERN ALGAE COLORADO,

Vaxtbiologiska Institutionen, Uppsala (Sweden). K. Thomasson.

Svensk Botanisk Tidskrift, Vol 58, No 1, p 73-80, 1964. 1 fig, 1 tab, 16 ref.

*Systematics, *Alga Plankton, Benthos, *Algae, Descriptors: *Lakes. Diatoms. *Colorado. Nutrients, Bottom sediments, Detritus, Chemical

Nutrients, Bottom sediments, Describer Physical properties.

Identifiers: Carter Lake(Colo),

Identifiers: Brainard Lake(Colo),

Describer Physical Properties. Redrock Lake(Colo), Lake Isabelle(Colo), Desmids, Moun-

These notes are based on five plankton samples, one from each of five lakes. Carter Lake is an eight-year old artificial lake in Colorado, in the extensive Colorado-Big Thompson Water Conservation System. Redrock Lake is a semidrainage 'nitrogen-accumulator'. Brainard Lake is an artifi-cial lake made in 1892 by damming a creek. Long Lake, one of the larger natural lakes of the area, is located in a U-shaped valley. Lake Isabelle is a typical mountain tarn, with the Continental Divide in the immediate background. Summing up results from these random samples, the plankton of Carter Lake is entirely different from that of the mountain lakes, and is characterized by predominance of Fragilaria crotonensis and Asterionella formosa. Among the planktic desmids only Staurastrum longipes and S. planctonicum occur in significant quantities. On the other hand, desmids are numerous in the samples from the mountain lakes, even if the benthic taxa are not considered. In the four mountain lakes the population of planktic diatoms is markedly lower than in Carter Lake. Lake Isabelle, at the highest elevation, has the poorest plankton, the shortest growing season, lowest summer maximum tempera-tures, and lowest supply of nutrients due to its small drainage area. (Jones-Wisconsin) W74-12666 THE MAJOR RIVERS OF NORTHERN SWEDEN, N Quennerstedt

Acta Phytogeographica Suecica, Vol 50, p 198-204, 1965, 3 fig.

Descriptors: *Rivers, *Aquatic Distribution. Vegetation, Lichens Algae. Diatoms, Water level fluctuations, Cyanophyta, Chlorophyta, Rhodophyta, Turbulent flow. Identifiers: *Sweden, Torne River(Sweden), Kalix River(Sweden), Pite River(Sweden).

Of the twelve large northern Sweden's main rivers, only three have not been changed by hydroelectric development. These are the Torne, the Kalix, and the Pite rivers. Vascular vegetation, inhabiting finer sediments and especially the mud bottoms of slack-water reaches, mostly consists of long-shoot plants, such as Potamogeton gramineus, P. perfoliatus and Myriophyllum alterniflorum; Sparganium is usually present and S. angustifolium, probably the most common species, together with its hybrid with S. Friesii are recognized in several rivers. Isoetids are frequently found and Isoetes lacustris is usually predominant. In the large main rivers, reeds--Phragmites--occur sporadically and likewise Scirpus lacustris, none of these existing in large colonies. Equisetum fluviatile, on the other hand, grows abundantly, particularly on the fine-grained riverbeds. One species of macro-algae, Nitella opaca, is fairly common in the main rivers. The algae occurring at the different seasons especially at flood time and the following dry seasons are listed. It would seem that the Torne River shows a greater differentiation in the total range of vegetation than most of the other north Swedish rivers, and vegetation of a distinct eutrophic trend is sometimes encountered. (Jones-Wisconsin) W74-12668

STUDIES ON PHYTOPLANKTON PIGMENTS PORTO NOVO WATERS (INDIA). II. BACKWATER, Marine Biological Station, Porto Novo (India).

Marine Biological Station, Porto Novo (India). K. Krishnamurthy, and V. Sundararaj. Journal of Experimental Marine Biology and Ecology, Vol 14, No 3. p 285-294, 1974. 6 fig. 1 tab, 17 ref.

Descriptors: *Phytoplankton. *Pigments, Backwater, Chlorophyll, Seasonal, Neritic. Identifiers: *Porto Novo(India), Bay of Bengal, Carotenoids. Phaeopigments, Noctiluca. Coscinodiscus Thalassiothrix Biddulphia. Hemidiscus, Melosira, Rhizosolenia.

The Backwater in Porto Novo, India waters exposes areas of very fertile mudflats which contain mostly sedentary and semi-sedentary organisms. Rich and fertile oyster beds are dominant formations. The fresh water flow in the system is largely through rivulets, irrigation channels, and seasonal freshwater discharges through the Vellar Estuary. The annual cycle of phytoplankton pigments and characteristics of their distribution are presented. Chlorophyll-a varied from 2.91-65.56 micrograms/l, chlorophyll-b from 0-1.90 micrograms/l, chlorophyll-c from 0-38.60 micrograms/l, plant carotenoids from 0.30-22.34 MSPU/cu m. phaeopigments from 0-31.51 micrograms/l. Primary maximum of chlorphyll-a appeared during June at Stations 3-5 and during May at Station 6. Stations 3 and 4 had secondary chlorophyll-a maxima during September and Stations 5 and 6 during August. In general, all the stations showed an increasing trend of chlorophyll-a values before the main peak. The chlorophyll maximum was mainly due to the presence of phytoplankton species belonging to the genera Noctiluca, Coscinodiscus, Thalassiothrix, Biddulphia, Hemidiscus, Melosira and Rhizosolenia. Chlorophyll-a concentration was normally affected by rainfall. (Jones-Wiscon-W74-12669

Group 5C-Effects Of Pollution

DIATOMS IN THE LAKE VEGETATION OF THE LANGAN DRAINAGE AREA, JAMTLAND, (DIATOMEERNAILANGANS SJOVEGETATION), Vaxtbiologiska Institutionen, Uppsala (Sweden).

N. Ouennerstedt.

Acta Phytogeographica Suecica, Vol 36. 208 p, 39 fig, 15 tab, 370 ref. English summary.

Descriptors: *Diatoms, *Lakes, *Vegetation, Water level fluctuation, Plankton, Benthos, Geology, Fish, Aquatic plants, Mosses, Crustaceans, Rotifers, Phytoplankton, Cyanophyta, Watersheds(Basins), Systematics, Physical properties, Chemical properties, Alpine, Algae, Geologic history.
Identifiers: *Sweden, Jamtland(Sweden), Moun-

tain lakes, Langan River(Sweden).

Biological investigations in the Langan district of western Jamtland, Sweden were undertaken to preserve a record of the plant and animal life existing in a mountain lake system destined for water storage purposes. These investigations have chiefly been directed towards the vegetation with emphasis on the diatoms which are catalogued. The physical and chemical characteristics of the lakes and the topography, geology, climate of the Langan drainage area are given. Of the Langan lakes, Ovre Oldsjon has been studied best. The vascular plant vegetation is characterized most by isoetides predominated by Isoetes lacustris. A characteristic of the lake's vegetation are submersed mosses. In general, Crustacea and Rotifera are predominate in the plankton; the phytoplankton is quantitatively small. The dominant benthic algal vegetation is composed of Cyanophyceae and diatoms. Vertical sections of sediment in southern Ovre Oldsjon were taken and a relative chronology was evolved with the aid of pollen diagrams. The postglacial history of Ovre Oldsjon shows the trend is toward a lower trophic standard, a meiotrophication. (Jones-Wisconsin) W74-12670

LAKE VATTERN. OUTLINES OF ITS NATURAL HISTORY, ESPECIALLY ITS VEGETA-TION.

Uppsala Univ. (Sweden). Inst. for Plant Ecology. N. Salberg.

Acta Phytogeographica Suecica, Vol. XI, 1939. 60 p, 1 fig, 8 plates, 74 ref.

Descriptors: *Lakes, *Vegetation, Geologic history, Temperature, Algae, Aquatic plants, Chara, Hydrography, Chemical properties, Algae, Zooplankton, Physical properties, Identifiers: *Lake Vattern(Sweden), Trans-

parency.

A survey is presented of Lake Vattern, Sweden, a lake especially interesting because of its clarity, its great depth, stormy character, and the play of colors in its waters. Records go back to 1664. Its 1900 square kilometers fill a fault in the earth's crust, and it has an alternately lacustrine and marine postglacial history. The higher vegetation and algae descend deeply into the lake. Nitella opaca was lowered to depths varying from 4-20 m. The percentage of oxygen was constant at a depth of about 10 m. When a continuous southerly wind prevails there accumulates in northern Vattern a relatively homothermal layer of warm epilimnetic water, the thickness of which sometimes reaches the bottom. Then the southern parts are cooled and they have bottom temperature'; when the wind is from the north, the opposite is true. Chemical analyses were made. The algae from the southern part near Jonkoping collected in July-August 1898, are reprinted. Common plankton species are listed. Phytogeographical distribution and some phytogeographically interesting species, the vascular vegetation of southern, middle and northern Vattern, flora and vegetation of Characeae, and flora and vegetation of epilithic algae are all given. (Jones-Wisconsin) W74-12671

SALT MARSH VEGETATION IN SOUTHERN SWEDEN, V. Gillner.

Acta Phytogeographica Suecica, Vol 50, p 97-104, 1965. 3 fig, 15 ref.

Descriptors: *Salt marshes, *Vegetation, Salinity, Brackish water, Littoral, Shares, Aquatic plants. Identifiers: *Sweden.

The Swedish salt marsh is rather narrowly defined to include only the plant life of the geolittoral zone. The terrestrial meadow immediately above and the hydrolittoral immediately below this belt are considered and briefly discussed as contact vegetation. First the salt marsh vegetation of the west coast is described and compared with the salt marsh farther south, on the Oresund. The com-position of brackish meadow vegetation along the east coast south of and within the Kalmarsund area is briefly touched upon. Further northwards the marshes become increasingly like freshwater ones, but some marine species occur all around the ones, our some marine species occur all around the Gulf of Bothnia. A survey showed that the salt marsh vegetation is most varied at the west coast, where habitat conditions offer the widest range. In their most typical form the salt marshes of the west coast resemble those of the North Sea coast, though in a much smaller scale and with rather fewer species. Locally freshwater seepages may give rise to similarities with the brackish marshes of the Baltic. Each of the three areas described, the west coast, Oresund and the southern Baltic coast, has certain floristic peculiarities of its own. (Jones-Wisconsin) W74-12672

NOTES ON ALGAL VEGETATION OF LAKE

Vaxtbiologiska Institutionen, Uppsala (Sweden). K. Thomasson.

Nova Acta Regiae Societatis Scientiarum Up-saliensis, Ser IV, Vol 19, No 1, p 3-34, 1965. 13 fig, 2 tab, 107 ref.

*Tropical Descriptors: *Algae, *Systematics, Plankton, Diatoms, Lakes, analysis, Thermal stratification, Aquatic life. Identifiers: *Lake Kariba(Rhodesia), Salvinia auriculata

The algae and other aquatic life of tropical Lake Kariba, located between Zambia and Northern Rhodesia, is described. The lake's surface tem-perature varies between 23 and 29C. Physical measurements and results of chemical analyses are given. The main stress was laid on desmids but members of other groups were studied to some extent and a few notes on animals are included. Only a few diatoms are listed. The most imposing fea-ture was the explosive growth of Salvinia auriculata, which covered more than 23,000 ha of the lake surface by the end of 1959 and more than 67,000 ha in early 1960. The character of the algal flora is unmistakably tropical. Plankter and tychoplankter distribution is given and is com-pared with their occurrence in Lake Bangweulu in northern Zambia. Some taxonomical comments, with illustrations, are made on about 70 algae and animals. (Jones-Wisconsin) W74-12673

WATER QUALITY CRITERIA 1972, A REPORT OF THE COMMITTEE ON WATER QUALITY CRITERIA.

National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Roard

For primary bibliographic entry see Field 5G. W74-12674

KESEARCH NEEDS IN WATER QUALITY CRITERIA, 1972.

National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental

For primary bibliographic entry see Field 5G.

ENVIRONMENTAL POLLUTION FLUORINE WITH RESPECT TO THE PROSPECTIVE ALUMINUM FACTORIES IN KYUSHU, JAPAN (IN JAPANESE), Kagoshima Univ. (Japan). Dept. of Chemistry.

T Onishi

Sci Rep Kagoshima Univ. 21, p 45-55. 1972. Illus.

Descriptors: *Aluminum, Environment, Industrial plants, *Fluorine, *Water pollution sources, Air poliution. Identifiers: Japan, Kyushu.

In view of the aluminum electrolyte smelting factories planned to be established in the area, distribution and sources of fluorine in Kyushu, Japan, were studied. Fluorine levels in the rain, air, volcanoes and rivers were studied. The area was a highly fluorine-polluted area. Effects of fluorine on humans and plants were also studied. Such fluorine-related symptoms as excessive bone growths, liver and kidney disorders and spotted teeth in humans have not yet been reported in the area. Measures should be taken against possible effects of fluorine before the establishment of the factories .-- Copyright 1973, Biological Abstracts, W74-12680

LEPTOSPIROSIS: AN EPIDEMIC IN CHIL-DREN,

for Disease Control, Atlanta, Ga. Center Epidemiology Program. R. M. Barkin, and J. W. Glosser.

Am J Epidemiol. Vol 98, No 3, p 184-191. 1973.

Descriptors: *Water pollution effects, *Diseases, *Human diseases, *Animal diseases, Domestic animals, Public health, *Epidemics storm runoff,

Identifiers: Children, Dogs, Leptospira-canicola, *Leptospirosis, Texas.

Leptospirosis (7 cases) caused by serotype (Leptospira) canicola occurred in Baytown, Texas, in the summer of 1971. The 1st case was in a 1.5-vr-old child who became ill on July 4. The subsequent cases occurred between Aug. 12 and 15 in children 4 - 15 yr of age. All the children were members of a large family living in a trailer camp. The children had similar symptoms. All cases were serologically confirmed, and leptospires were isolated from urines of 3 children. The family's pet dogs were also infected with (L) canicola. Isolates from the children and the dogs were identical to (L) canicola Hond Utrecht. The infected children and dogs played in pools of water caused by heavy rains. Direct and indirect transmission of leptospires probably occurred in this epidemic.--Copyright 1974, Biological Abstracts, Inc. W74-12685

AZOTOBACTER CHROOCOCCUM IN THE PHYLLOSPHERE OF WATER HYACINTH (EICHHORNIA CRASSIPES MERT. SOLMS), Indian Agricultural Research Inst., New Delhi.

Div. of Microbiology.
For primary bibliographic entry see Field 21.
W74-12686

BIOGEOCHEMISTRY OF THE RARE-EARTH ELEMENTS IN AQUATIC MACROPHYTES OF LINSLEY POND, NORTH BRANDFORD, CON-

NECTICUT, Pittsburgh Univ., Pa. Dept. of Biology For primary bibliographic entry see Field 5A. W74-12687

Effects Of Pollution—Group 5C

VEGETATIONAL ZONATION IN TWO SUC-CESSIONAL BRACKISH MARSHES OF THE CHESAPEAKE BAY, Duke Univ., Durham, N.C. Dept. of Botany.

Chesapeake Sci. Vol 14, No 3, p 197-200. 1973.

Descriptors: *Maryland, Aquatic life, Aquatic plants, Wetlands, *Salt marshes, Marsh plants, Brackish water, *Chesapeake Bay, *Vegetation. Identifiers: Depth, Height, Marshes, Salinity, Scirpus-olneyi, Scirpus-robustus, Spartina-alter-niflora, Typha-angustifolia, Soil depth, Tidal

Vascular plant zonation and successional stages were studied in 2 brackish marshes of Calvert County, Maryland. One marsh is mature and stable, while the other is undergoing rapid succession from a former lake bottom. Soil depth, water salinity, and tidal heights were measured. Transect surveys show a general zonation of Spartina alterniflora to Scirpus olneyi to upland vegetation in the stable marsh and a Spartina alterniflora to Scirpus robustus to Typha angustifolia to upland vegetation succession in the developing marsh. Elevation of the marsh relative to mean high water is the most obvious factor influencing the plant distribution.--Copyright 1974, Biological Abstracts, Inc. W74-12689

ECOLOGY AND PRODUCTION OF JUVENILE SPRING CHINOOK SALMON, ONCOR-HYNCHUS TSHAWYTSCHA, IN A EUTROPHIC RESERVOIR.

Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.

D. L. Higley, and C. E. Bond.

U S Natl Mar Fish Serv Fish Bull. Vol 71, No 3, p 877-891, 1973, Illus.

Descriptors: Fish, Aquatic life, Juvenile fish, Fry Fish stocking, Fish hatcheries, Fish genetics, Fish reproduction, Salmon, Toxins, Fish toxins, Salmonids, *Oregon, *Chinook salmon.
Identifiers: Chaoborid, Entomostraca, Oncor-

hynchus-kisutch, Oncorhynchus-tshawytscha, Reservoirs, Juvenile salmon, Rearing sites.

Juvenile spring chinook salmon, Oncorhynchus tshawytscha, were reared in a central Oregon reservoir of 7.5 ha. The reservoir is strongly eutrophic, as shown by its heavy sedimentation, summer stratification and chemical qualities (total dissolved solids over 200 ppm, total P to 0.4 ppm and summer pH between 9 and 10). Surface water temperatures ranged from 3-29 degrees C. Salmon were apparently confined to the upper 3 m during the summer because of low dissolved oxygen below this depth. In 1961, epilimnion conditions of below this depth. In 1961, epiliminon conditions of high pH, high temperatures, decreasing oxygen concentrations and possibly algal toxins caused condition loss and deaths among salmon. Fry planted in 1961 (75,300) and in 1962 (150,000) suffered 1st-summer mortalities in excess of 80%, primarily due to predation by older salmon. Summer growth was rapid, but dependent on population densities. Coho salmon, O. kisutch and chirach capters response to 1969, plant chinook salmon remaining from a 1959 plant averaged 280 and 215 g after 3 mo. The 1961 year class averaged 62 g at 10 mo. and 89 g at 22 mo. The 1962 year class averaged 22 g at 9 mo. Average condition factor values rose above 1.20 in the summer. Net production by the 1961 year class was 159 kg/ha in 1962. The 1962 year class produced 170 kg/ha in 1962. Potential Dec. yield of Ist-yr salmon was 98 kg/ha in 1961 and 73.5 kg/ha in 1962. First-year salmon are primarily Entomostraca and chaborid larvae. Apparently competition from the 1962 year class caused the 1961 year class to feed more on littoral and terrestrial forms and to grow and produce less in their 2nd year. Age class I and age class II salmon weighing from 25-189 g emigrated via spillway outflows. In 1963, migrations occurred only at temperatures above 10

degrees C: this relationship was not observed in 1962. This reservoir, or others with similar limnological conditions, cannot be recommended as a rearing site for chinook salmon because of the severe summer conditions.--Copyright 1974, Biological Abstracts, Inc.

COXSACKIEVIRUS B EPIDEMIC AT A BOYS' SUMMER CAMP: ISOLATION OF VIRUS FROM SWIMMING WATER,

Vermont Univ., Burlington.
For primary bibliographic entry see Field 5A. W74-12698

PRIMARY PHYTOPLANKTON PRODUCTIVITY IN THE EASTERN MURMAN BAYS, (IN RUSSIAN), Murmanskii Morskoi Biologicheskii Institut

A. A. Solov' eva

Gidrobiol Zh. Vol 9, No 4, p 14-19. Illus. 1973. En-Gidrobioi za... glish summary. Bays,

Chaetoceros-compressus, Chaetoceros-subsecundus, *(
Diatoms, Eastern, Flagellates, *Chlorophyll, Fragilariaoceanica, Murman, Nitzschia-seriata, *Phytoplankton, *Primary productivity, Russian-SFSR: Salinity, Skeletonema-costatum, Thalas-siosira-nordenskioldii, *USSR(East Murman bays), *Eutrophication.

Qualitative and quantitative phytoplankton composition, the chlorophyll content, and organic sub-stances appearance in the superficial layer of 2 East Murman Bays (Russian SFSR, USSR) are considered. Two peaks are pointed out in the phytoplankton development, depending on 2 essential algae groups: diatoms (Fragilaria oceanica, Thalassiosira nordenskioldii, Chaetocerus com-pressus, C. subsecundus, Skeletonema costatum, Nitzschia seriata), and diatoms and small flagellates. The late summer peak in one of the bays is a result of freshening of the water. Dependence was found between phytoplankton productivity, chlorophyll a content and the phytoplankton cell number.—Copyright 1974, Biological Abstracts, Inc. W74-12703

ECTOPARASITIC INFUSORIA OF STICKLEBACK FROM THE NEVA DELTA, USSR, (IN RUSSIAN).

For primary bibliographic entry see Field 2L.

SPECIES AND QUANTITATIVE CONTENT OF THE PLANKTON AND BENTHOS OF THE AGGEL' LAKE, (IN RUSSIAN),
For primary bibliographic entry see Field 2H.

W74-12708

NUTRIENT ENRICHMENT OF NATURAL WATERS.

Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 5B. W74-12709

THE RELATIONSHIP OF BACTERIA AND BLUE-GREEN ALGAE, (IN RUSSIAN), Akademiya Nauk URSR, Kiev. Inst. of

L. E. Mikhailenko, and I. Ya. Kulikova Gidrobiol Zh. Vol 9, No 2, p 52-59, 1973. Illus.

Identifiers: Algae, Aphanizomenon, *Bacteria, Microcystis, Plankton, *Cyanophyta, Eutrophica-

The number of total bacteria and saprophytic bacteria in the Kiev and Kremenchug Reservoirs (USSR) reached peaks in the spring and the summer-fall period. The 1st increase was associated with the presence of large amounts of al-lochthonous microflora, the 2nd with favorable temperatures and the massive 'blooming' of phytoplankton which released many biogenic substances. Bacterial development was directly linked to phytoplankton content and the amount of organic matter. The bacteria count in the seston was determined in surface layers associated with blooming of Microcystis and in some cases Aphanizomenon. The amount of bacterial biomass Aphanizomenon. The amount of dacterial biomass increased with aging and dying of the algae. The number of saprophytic bacteria mineralizing proteins was counted in the range of millions and tens of millions of cells/g of seston. The values were much higher than those obtained for soil from these waters. The data indicate that Microcystis and Aphanizomenon at all stages of development are good substrates for bacteria and contradict theories on the bactericidal effect of algae.--Copyright 1974, Biological Abstracts, Inc. W74-12710

REASONS FOR CRITICISM OF THE SYSTEM OF SAPROBIONTS,

Polskie Towarzystwo Przyrodnikow im Kopernika, Warsaw.

For primary bibliographic entry see Field 5B. W74-12711

A CONTRIBUTION TO THE ECOLOGICAL STUDY OF THE BOU REGREG ESTUARY: THE PROBLEM OF POLLUTION.

Institut Scientifique Cherifien, Rabat (Morocco). Lab. of Zoology. B. Elkaim.

Bull Soc Sci Nat Phys Maroc. 51, p 203-212. 1971. Illins

Identifiers: *Morocco(Bou-Regreg estuary), Estuaries, *Biochemical oxygen de *Dissolved oxygen, Water pollution effects.

The BOD (biological O2 demand) and DO (dissolved O2) values are given for 5 stations over tussolved O2) values are given for 5 stations over a 5 yr period. Pollution is increasing, as is evidenced by the proliferation of a certain species favored by pollution with the elimination of other species affected by this pollution.—Copyright 1974, Biological Abstracts, Inc. W74-12712

MERCURY IN AQUATIC BIRDS AT CLAY LAKE, WESTERN ONTARIO,

Canadian Wildlife Service, Edmonton (Alberta). K. Vermeer, F. A. J. Armstrong, and D. R. M.

J Wildl Manage. Vol 37, No 1, p 58-61, 1973 Identifiers: *Canada(Clay Lake), *M *Toxicity, Birds, Clay Lake, *Water birds. *Mercury.

Total Hg levels ranging from 2-16 ppm in eggs did not appear to affect the hatching and fledging of herring gulls (Larus argentatus). Hg levels in breast muscles of 5 American widgeons (Mareca americana), 16 mallards (Anas platyrhynchos), 17 blue-winged teals (Anas discors), 21 common gol-deneyes (Bucephala clangula), 17 common mergansers (Mergus merganser) and 7 hooded mergangansers (Mergus merganser) and 7 hooded mergan-sers (Lophodytes cucullatus) averaged 0.5, 6.1, 6.5, 7.8, 6.8, and 12.3 ppm respectively at Clay Lake (Ontario, Canada) 4-6 wk prior to the hunting season in 1971. Methyl Hg in 5 ducks ranged from 69 - 99% of total Hg. Crayfish (Orconectes virilis) muscle contained the highest Hg levels of food items found in esophagi and stomachs of ducks. The high values in breast muscles of hooded mergansers are likely related to their feeding on cray-fish.—Copyright 1974, Biological Abstracts, Inc. W74-12717

HELMINTHS OF SOCKEYE SALMON (ONCORHYNCHUS NERKA) FROM THE KVICHAK RIVER SYSTEM, BRISTOL BAY, ALASKA, Battelle-Pacific Northwest Labs., Richland,

Wash. Ecosystems Dept.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects Of Pollution

D. A. Pennell, C. D. Becker, and N. R. Scofield. US Natl Mar Fish Serv Fish Bull. Vol 71, No 1, p 267-277, 1973, Illus.

Descriptors: *Salmon *Sockeye salmon, Juvenile fish, *Alaska, United States, Smolt, Freshwater *Diseases

Identifiers: Anisakis, Bolbosoma-caenoforme. Brachyphallus-crenatus, Contracaecum, Diphyllobothrium, Diplostomulum, Echinorhynchus-Eubothrium-salvelini, Gyrodactyloidesstrelkowi. Helminths. Lecithaster-gibbosus, Neoechinorhynchus-rutili, Oncorhynchus-nerka, Phyllobothrium-cau-Philonema-oncorhynchi, Proteocephalus. Rhabdochona datum. Triaenophorus-crassus, Tubulovesicula-lindbergi, Kvichak River, *Bristol Bay(Alas).

A study of helminths infecting juvenile and adult sockeye salmon (O. nerka) leaving and entering the Kvichak River system, Bristol Bay, Alaska (USA) was conducted in 1969. Ten helminths acquired in fresh water were found in smolts: Diplostomulum sp.; an unidentified trematode; Diphyllobothrium spp.; Triaenophorus crassus Forel, 1868; Proteocephalus sp.; Eubothrium salvelini (Schrank, 1790); Neoechinorhynchus rutili (Mueller, 1789); Philonema oncorhynchi Kuitunen-Ekbaum, 1933; Rhabdochona sp.; and Contracaecum sp. In addition to surviving larval stages of freshwater parasites, adults were infected by 9 helminths acquired in the sea: Gyrodactyloides strelkowi Bykhovskaya and Polyanskaya, 1953; Lecithaster gibbosus (Rud., 1802); Brachyphallus crenatus (Rud., 1802); Tubulovesicula lindbergi (Layman, 1930); Phyllobothrium caudatum (Zschokke and Heitz, 1914); Echinorhynchus gadi Mueller, 1776; Bolbosoma caenoforme Heitz, 1920; Anisakis sp.; and Contracaecum sp. Infection incidences and intensities are tabulated where accurate data are available. Information on life histories is assembled from scattered sources, and some ecological aspects of helminths infecting Kvichak sockeye salmon are briefly discussed. Copyright 1974, Biological Abstracts, Inc. W74-12719

CLASSIFICATION AND COMMUNITY STRUC-TURE OF MACROBENTHOS IN THE HAMP-TON ROADS AREA, VIRGINIA,

Virginia Inst. of Marine Science, Gloucester Point. For primary bibliographic entry see Field 5A.

STUDIES ON THE ANEMIA OF FISH: V. DIETARY IRON DEFICIENT ANEMIA IN BROOK TROUT, SALVELINUS FONTINALIS, Fisheries Research Lab., Tokyo Freshwater (Japan).

H. Kawatsu.

Bull Freshwater Fish Res Lab. Vol 22, No 1, p 59-67, 1972, Illus,

Identifiers: *Anemia(Fish), Salvelinus-Fontinalis, *Fish disease, Brook trout, Fish diets.

Hematological observation was made on the brook trout fed on a synthetic diet in which Fe was excluded from mineral supplements. The anemia induced by dietary iron deficiency was characteristic of the hypochromic microcytic anemia. The decrease rate of Hb was larger than the red blood cell count and hematocrit. The latent period was found before the MCHC (mean corpuscular concentration) drastically decreased. In the recovery test, the MCHC reached the initial level within 3 wk and the MCV (mean corpuscular volume) within 6 wk. The percentage of immature erythrocytes did not decrease under the conditions of Fe deficiency. Regarding the leukocytes, no recognizable changes were observed in relation to Fe deficiency .-- Copyright 1973, Biological Abstracts. Inc.

ON THE LITTORAL ALGAE OF THE LAKE NUUKSION PITKAJARVI, SOUTHERN FIN-LAND: I. ECOLOGY OF THE MOST IMPOR-TANT ALGAL SPECIES

Helsinki Univ. (Finland). Dept. of Limnology. T. Tikkanen.

Ann Bot Fenn. Vol 9, No 3, p 117-125. 1972.

(English summary). Identifiers: *Algae, *Finland(Lake Nuuksion), Pitkajarvi, Lakes, Water pollution effects.

The composition and occurrence of the littoral algal flora of a relatively oligotrophic southern Finnish lake are described. The environmental factors considered are fluctuations in the water level. shore type, depth, solar radiation and the quality of the substrate. The 43 most important taxa are presented .-- Copyright 1973, Biological Abstracts, W74-12738

STUDIES ON GILL PARASITOSIS OF THE GRASSCARP (CTENOPHARYNGODON-IDEL-LA) CAUSED BY DACTYLOGYRUS LAMEL-LATUS ACHMEROV, 1952: IV. HISTOLOGI-CAL CHANGES. K. Molnar.

Acta Vet Acad Sci Hung. Vol 22, No 1, p 9-24. 1972. Illus.

Identifiers: *Carp, Ctenopharyngodon, Dactylo-gyrus, Necorsis, Parsitosis, *Fish parasites, *Grasscarp.

Gills of healthy grasscarps (C. idella) and specimens infected with D. lamellatus were examined. The anatomical and histological structure of normal branchial lamellae is described to aid diagnostic comparison. Establishment of D. lamellatus parasites on the gill lamellae gives rise to local and general lesions. The local lesions com-prise erosions, endothelial impairment and minor areas of cell degeneration around the site of attachment of the parasite. The general gill lesions degeneration, tissue damage, hemorrhages, necrosis, atrophy and cell proliferation. The nature of the lesions depends on the duration of the disease, the number of parasites established on the gill and the extent of regeneration. If the infection takes a rapid course, the typical lesion is degeneration of the respiratory plate epithelium. In acute dactylogyrosis this is compensated by proliferation of the cuboidal cells of the lamellar epithelium which results in the disappearance of respiratory plates, process-like transformation and adhesion of the lamellae. If the condition is chronic, the respiratory epithelium becomes damaged, the epithelium atrophies and the lamellae necrotize but there is only a local degeneration .- Copyright 1973, Biological Abstracts, Inc. W74-12740

ARSENIC-CONTAINING MINERAL WATERS ON TISSUE RESPIRATION FOLLOWING INTERNAL AND EXTERNAL USE, (IN RUSSIAN),

7. I. Semenovich. Vopr Kurortol Fizioter Lech Fiz Kul't. Vol 36, No

6, p 538-541, 1971. Identifiers: *Arsenic, *Rats, *Respiration, Tissue.

The As-containing mineral water of the Sinegorsk deposit, USSR, when taken internally for 7 days caused a decrease in O2 consumption by 40% rat liver and by 27% in kidney; when taken for 14 days it decreased by 31 and 36%, respectively. After a course of baths in As-containing water the O2 consumption by liver tissue decreased 44%, and by the kidney tissue, 41%. One month after completing the course of baths a decrease of O2 consumption by liver tissue (by 30%) was still noted.—Copyright 1973, Biological Abstracts, Inc. W74-12745 LONG-TERM CHANGES IN THE PARASITIC FAUNA OF SOME FISH IN THE DNIESTER BASIN, (IN RUSSIAN), Zooveterynarnyi Instytut, Lvov (USSR).

rimary bibliographic entry see Field 2H. W74-12746

PARASITES OF FISH FROM LAKE SAREZ

(PAMIRS), (IN RUSSIAN), Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii. M Ashurova

Parazitologiya. 7(2): 164-168. 1973. (Engl summ) Identifiers: Pamirs, Schizopygopsis, *USSR(Lake Sarey), Lakes, *Fish parasites.

The parasite fauna of Schizothorax intermedius and Schizopygopsis stoliczkai from Lake Sarez the central part of Pamirs USSR) and its peculiarities in connection with ecological conditions of hosts' habitats are described.—Copyright 1973, Biological Abstracts, Inc.

5D. Waste Treatment Processes

METABOLISM OF COMPONENTS OF EX-TENDED AERATION ACTIVATED SLUDGE, Oklahoma State Univ., Stillwater. School of Civil

Engineering. A. F. Gaudy, Jr.

A. F. Gaudy, Jr. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 636, \$5.00 in paper copy, \$2.25 in microfiche. Oklahoma Water Resources Institute, Stillware, Completion Report, (1974). 172 p, 6 append. OWRT A-035-OKLA(3) 14-31-0001-4036.

Descriptors: *Waste water treatment, *Aeration, Microbial degradation, Oxidation, *Hydrolysis, *Activated sludge, *Biological treatment, *Metabolism, Microorganisms, Cytological studies, Pilot plants.
Identifiers: *Extended aeration.

The use of biological cells and/or their individual cell components as substrates by other microorganisms was investigated. The utilization of microorganisms as substrates concurrently with performance of their functions as substrate users is the basic concept upon which the extended aerais the basic concept upon which the extended aeri-tion or total oxidation process is based. This aspect was investigated directly by growing, in pure culture, cells which produced copious amounts of extracellular polysaccharide, harvesting polysaccharide and feeding it as sole source of ing polysaccharide and feeding it as sole source of carbon to heterogeneous microbial populations of sewage origin. After a period of acclimation, heterogeneous microbial populations could be developed which metabolized this extracellular polysaccharide material very rapidly. Long-term pilot plant studies were undertaken in which the 'hydrolytic assist' to an extended aeration process was examined. The 'hydrolytic assist' involves withdrawing some cells and performing chemical

withdrawing some cells and performing chemical hydrolysis in order to solubilize some of the macromolecules. This portion of the sludge is then matronolecures. This potential of the studge along with intact cells. Long-term plant experiments were run to determine if this mode of operation could pro-vide for adequate control of biological solids concentration and permit the system to retain its nitri-fying characteristics as well as high substrate removal capability. Such a process was indeed feasible. Aspects of cell maintenance were examined; model equations for biological solids con-centration and effluent substrate concentration would be improved with respect to prediction of excess biological sludge or cell output by the inclusion of a term for cell maintenance.

W74-12001

COMPUTER MANAGEMENT OF A COMBINED SEWER SYSTEM.

Municipality of Metropolitan Seattle, Wash.

Waste Treatment Processes—Group 5D

C. P. Leiser.

Copy available from GPO Sup Doc as EP1.23:670/2-74-022, \$5.30; microfiche from NTIS. Springfield, Va 22161 as PB-235 717, PC\$8.30, \$2.25 microfiche. Environmental Protection Agency, Cincinnati, Ohio, Technology Series, Report EPA-670/2-74-022, July 1974. 474 p, 108 fig. 49 tab, 51 ref, 13 append. EPA Project 11022 ELK. Program Element 1BB034/ROAP 21-

Descriptors: *Computer programs, *Flow control. *Overflow, *Combined sewers, *Operating costs, *Remote control, *Computer models, Flow measurement, Mathematical models, Storm runoff, Runoff, Water pollution, *Waste water treatment, Sampling, Storage tanks, Telemetry, Monitors, Construction, Maintenance, *Washington. Identifiers: *Flow regulators, Computer control, In-sewer storage, *Seattle(Wash), Systems

management, Systems control.

At the conclusion of a ten-year construction program which affected much of Seattle's combined sewer system, a computer-controlled total systems management' complex was proposed, funded and constructed. Computer augmented treatment and disposal (CATAD) takes advantage of storage in the sewers to limit overflows, and selects overflow points based on water quality data. Since the control system began operating in 1971, receiving water quality, especially dissolved oxygen and coliform levels, has shown significant improvement: overflow volume has decreased by 50 to 60 percent during supervisory control and in excess of 90 percent during three months of limited automatic control. Eight pollution loading parameters were measured and found to be 68 percent less than before advanced control techniques. Capital costs totaled \$2.6 million for the control system at the 36 remote stations, or \$5.3 million, including construction of 15 gate-driven regulator stations. Annual maintenance and operation costs totaled \$270,000. The system is worth roughly \$40 to \$245 million in equivalent sewer separation. Work continues on a fully automatic optimizing model to add predicative capability to program decisions so the system could maintain an 80 percent overflow reduction. (See also W72-08984) W74-12003

HIGH-RATE LAND TREATMENT I: INFILTRA-TION AND HYDRAULIC ASPECTS OF THE FLUSHING MEADOWS PROJECT,

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. H. Bouwer, R. C. Rice, and E. D. Escarcega.

H. Bouwer, R. C. Rice, and E. D. Escarcega. Journal of the Water Pollution Control Federation, Vol 46, No 5, p 834-843, May 1974. 3 fig, 5 tab, 11 ref.

Descriptors: *Infiltration rates, *Flooding, Basins, Effluents, Irrigation, Recreation, *Water reuse, Hydraulics, Aquifers, Groundwater, Flow, Sewage effluents, *Tertiary treatment, *Arizona. Identifiers: High-rate infiltration, Flushing Meadows Project, Phoenix(Ariz).

An experimental high-rate land treatment system, the Flushing Meadows project, was initiated to study renovation of secondary sewage effluent for irrigation, recreation, and some industrial uses. The project attempted renovation through high-rate infiltration basins in the bed of the Salt River. It was found that infiltration rates decreased linearly during flooding and were restored sigmoidally during drying of the basins. One acre of basin area could renovate 0.36 mgd of effluent due to a hydraulic loading of 400 feet per year obtained by 20 to 30-day flooding periods alternated with 10-day drying periods in summer and 20-day drying periods in winter. The bottom condition most desirable for high infiltration rates was mature grass stand, followed by bare soil and then gravel. A deep, nonvegetated basin is thought to be most condusive to high infiltration rates. A uniform,

anisotrophic aquifer was assumed and showed good agreement with horizontal and vertical hydraulic conductivities obtained by a resistance netowork analog from groundwater level response to recharge and those obtained by well tests. The existence of active and passive flow regions was inferred by the effective transmissibility for recharge of twelve percent of the transmissibility for the entire saturated height of the unconfined aquifer. The hydraulic conductivity of the aquifer was not noticably affected by groundwater recharge with sewage effluent. (See also W74-12005) (Murphy-FIRL) W74-12005) (Murphy-FIRL)

HIGH-RATE LAND TREATMENT II: WATER QUALITY AND ECONOMIC ASPECTS OF THE FLUSHING MEADOWS PROJECT,

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

H. Bouwer, J. C. Lance, and M. S. Riggs.

Lournal of the Water Pollution Control Federation.

Journal of the Water Pollution Control Federation, Vol 46, No 5, p 844-859, May 1974. 9 fig, 3 tab, 15 ref.

Descriptors: *Water quality, *Costs, *Filtration, *Secondary treatment, Suspended solids, *Arizona, *Water reuse, Biochemical oxygen demand, Coliforms, Flooding, Nitrogen, Recycling, Recreation, Irrigation, Water reuse, Ammonium, Tertiary treatment, Hydrogen ion concentration. Identifiers: *Hydraulic loading, Organic carbon, *Phoenix(Ariz).

Water quality and economic aspects of the Flushing Meadows project in Phoenix, Arizona, were investigated. The filtration of the secondary effluent through the gravel and sand resulted in al-most complete removal of SS, BOD, and fecal coliforms, but total organic carbon was still present in concentrations of about five mg/liter. No fecal coliforms were encountered after 300 feet of horizontal travel. Total nitrogen load at the design hydraulic loading rate of 300 feet per year was 24,000 pounds per acre. Cyclic flooding and drying periods of several days each yielded essen-tially complete conversion of the nitrogen in the effluent to nitrate in the renovated water, but no removal of nitrogen. With flooding and drying periods of two weeks each, ammonium was adsorbed in the soil during flooding and nitrified; it was partially denitrified during drying. This yielded a net nitrogen removal of about 30 percent, which could be doubled or almost tripled by addition of organic carbon, recycling part of the renovated water, or by reducing the hydraulic loading rate. Phosphate removal was about 50 percent after 30 feet of underground travel, as was fluoride. Copper and zinc concentrations were reduced by about 80 percent. Dissolved salts con-tent of the renovated water was about two percent higher than that of the effluent. The pH was lowered from 8 to 7. It was concluded that high-quality renovated water suitable for unrestricted irrigation and recreation can be obtained. Cost was about \$5.3/acre-foot which is significantly less than the cost of equivalent in-plant tertiary treatment required to produce a water of similar quality. (See also W74-12004) (Murphy-FIRL) W74-12005

WHAT'S NEW IN WATER AND SEWER PIPE, For primary bibliographic entry see Field 8A. W74.12007

RPC DIVISION, MIDLAND-ROSS CORP. 10-GALLON-PER-MINUTE LIQUID/LIQUID SEPARATOR,

Army Mobility Equipment Research and Development Center, Fort Belvoir, Va. Fuels Handling Equipment Div. For primary bibliographic entry see Field 5G.

W74-12009

A STUDY OF SELECTED COOLING POND DESIGN TECHNIQUES,

South Carolina Univ., Columbia. Coll. of Engineering.

gineering. J. H. Gibbons, and F. P. Pike. Available from NTIS, Springfield, Va. 22161 as SRO-701-1, Price \$5.45 printed copy; \$2.25 microfiche. Contract Report SRO-701-1, June 1973. 74 p, 5 fig, 65 ref. AEC Contract AT(38-1)-

Descriptors: *Water pollution control, *Cooling water, *Hydraulic design, *Thermal pollution, Model studies, Reviews, Design, *Waste water treatment.
Identifiers: *Cooling reservoirs.

The available literature on cooling ponds was reviewed; the importance of the mixing problem is stressed. Seven visits were made to six electric utilities in the Southeast, exploring their information needs in regard to cooling reservoirs and their thermal rejection problems in general. In addition, visits were made to the Edison Electric Institute and to two consulting firms. Only a very few utilities engage in any intensive design of cooling ponds. It is clear that no generally accepted design procedures for cooling ponds are yet available. The key problem is the degree of mixing, which can be measured only with great difficulty. If the lake is completely mixed, or the flow through it is plug flow, design procedures are available. These two solutions bracket the case of the real reservoir, which is partially mixed. It is possible with a heat-conduction model to successfully model existing reservoirs for which sufficient data are available. The best answer is provided by hydraulic modeling. (Knapp-USGS)

ZONAL CENTRIFUGATION: APPLIED ASPECTS IN ELUCIDATING CHEMICAL AND BIOLOGICAL FORMS, DISTRIBUTION AND AVAILABILITY OF HEAVY METALS IN THE ENVIRONMENT.

ENVIRONMENT,
Oak Ridge National Lab., Tenn.
J. N. Brantley, J. P. Breillatt, F. S. Brinkley, C. W.
Francis, and B. A. Halsall.
In: ORNL-NSF-EATC-6, p 195-221, January 1974.
7 fig. 5 tab, 6 ref.

Descriptors: *Soil contamination, *Pollutant abatement, *Soil treatment, *Radioactivity, *Toxins, *Centrifugation, Analytical techniques, Instrumentation, Research and development, Laboratories, Absorption, Waste treatment. Identifiers: *Zonal centrifugation.

One of the major objectives was to develop a large-scale zonal rotor capable of isopycnically banding soil and sediment particles in a nonaqueous density gradient. Zonal centrifugation has been shown to be a unique analytical tool for separating and identifying specific soil reaction products. Previous zonal work with soils and sediments was limited to swinging bucket rotors in which only 250 mg of sample could be banded in each bucket. Development of the large-scale zonal rotor will enable isopynic banding of 7 to 10 g of soil or sediment in one operation. Resolution in banding with the large-scale zonal rotor should also be enhanced. The increased capacity of the zonal rotor will allow more detailed characterization of each density band as well as providing sulficient material to evaluate the biological availability of a specific reaction product or adsorbed pollutant. (See also W74-12021) (Houser-ORNL) W74-12026

RECOVERY OF TOXIC METALS FROM IN-DUSTRIAL EFFLUENT SOLUTIONS BY SOL-VENT EXTRACTION, Oak Ridge National Lab., Tenn.

Oak Ridge National Lab., Tenn. F. L. Moore, W. S. Groenier, and W. E. Bayless. In: ORNL-NSF-EATC-6, p 333-359, January 1974. 7 fig, 4 tab, 8 ref.

Group 5D—Waste Treatment Processes

Descriptors: *Effluents, *Industrial wastes, 'Abatement, Water pollution control, Toxicity, Descriptors: *Solvent extractions, Research and development. Zinc, Mercury, Cadmium, Pilot plants, Industrial plants, Brines. *Waste water treatment. plants, Brines, *Waste water Identifiers: *Waste recovery.

Studies have continued on the applicability of the solvent extraction technique for pollution abatement of toxic metals in industrial effluents. Recent work on the extraction of inorganic mercury and organomercury compounds with quaternary amines is described, and studies of the extraction behavior of zinc and cadmium from aqueous cyanide solutions are discussed. Selected quaternary amines dissolved in diethylbenzene are con-siderably more effective than the pure diethylbenzene for the extraction of methylmercuric chloride and phenylmercuric acetate. The quaternary amines are the only extractants suitable for removing zinc and cadmium from cyanide solutions. A bench-scale mini-plant was designed and fabricated for operation with solvent extraction flowsheets for toxic metals removal. (See also W74-12021) (Houser-ORNL) W74-12033

ELECTROCHEMICAL RECOVERY REDUCIBLE INORGANIC FROM AQUEOUS STREAMS, POLLUTANTS

Oak Ridge National Lab., Tenn. F. A. Posey, and A. A. Palko.

In: ORNL-NSF-EATC-6, p 360-389, January 1974. 11 fig, 10 ref.

Descriptors: *Abatement, Water pollution control, Streams, *Inorganic compounds, Toxicity, *Metals, Lead, Copper, Cadmium, Electrodes, *Electrochemistry, Hydrogen ion concentration, Temperature, Industrial wastes, Effluents, Research and development, Laboratories, *Waste

Results of continuing studies on the use of porous and packed-bed electrodes for electrolytic recovery of dissolved heavy metals from flowing streams are presented. Effects of solution composition, temperature, pH, and other factors on the rate of reduction of lead, copper, cadmium, and some other metals on a carbon substrate are discussed. Lead, copper, and cadmium could be reduced over a useful range of electrode potentials from all the solutions examined, so that efficient removal of these substances on porous and packed-bed electrodes is feasible. Experiments on the feasibility of electrolytic treatment of two lead-containing industrial effluents are presented. One effluent, a dilute rinse water from a continu-ous lead-lead oxide strip plating operation, could not be treated efficiently because of limited solu-tion conductivity. The other effluent, from the manufacture of organolead compounds, was successfully treated electrolytically to remove dis-solved inorganic and organic lead compounds from an organolead plant effluent under laboratory conditions. Progress in the development of prototype cells for lead recovery is discussed. (See also W74-12021) (Houser-ORNL) W74-12034

EFFECTS OF RADIOACTIVE STRONTIUM ON MICROFLORA OF WATER AND ON MINERALIZATION PROCESSES OF ORGANIC SUBSTANCES,

V. M. Zhogova. In: AEC-tr-7512, p 368-374, April 1974. 2 fig, 1 bibliography.

Descriptors: *Strontium, *Waste water treatment, *Water pollution treatment, *Aquatic environ-ment, Environmental effects, Treatment facilities, Microbiology, Silts, Reservoirs, Sewage disposal, Degradation, Biodegradation, Biological treat-

Identifiers: *Microflora

Sanitary agencies and designing organizations are faced with problems related to treatment and decontamination of sewage water containing radioactive substances. One would expect that radioactive substances present in sewage water and accumulated in active silt will have a deleteri-ous effect on the microfloral of biological treatment plants (biofilters, air tanks) thus lowering the efficiency of their operation. After reaching open reservoirs with liquid sewage, radioactive sub-stances could have an adverse effect on survival of aquatic microflora and the mineralizing activity of water with reference to organic substances, thus deteriorating the sanitary condition of reservoirs. Radioactive strontium is among the most hazardous elements in this respect, since it can be incorporated in biological cycle and can accumulate in some animal tissues and biosubstances. (See also W74-12038) (Houser-ORNL) W74-12041

STORAGE OF PLUTONIUM METAL IN SEALED CANS,

Dow Chemical Co., Golden, Colo. Rocky Flats Div. L. E. Musgrave.

Available from NTIS, Springfield, Va 22161 as Rept No RFP-2143; \$4/copy, \$2.25/microfiche. Report No RFP-2143, March 15, 1974. 16 p, 15 fig, 5 tab, 8 ref.

*Radioactive waste Descriptors: *Radioactive waste disposal, *Plutonium, *Waste storage, *Safety, Stability, *Corrosion, Oxidation, Water, Moisture, Humidity, Chemical reaction, Fire, Research and development, Metallurgy, Materials engineering. Identifiers: *Fire hazards.

Experiments have been conducted to assess the corrosion and fire hazards of plutonium metal stored in sealed produce cans. The amount of corrosion observed was about 10 times less than that expected in freely flowing air of 20 to 30% relative humidity. The reduction in corrosion is due to the reduced amount of oxidizer present in the sealed can; however, oxygen in air is not the chief oxidizer. Experiments with cans sealed in air and those sealed in low-oxygen atmospheres showed little difference in the amount of corrosion that later occurred. This suggests the main oxidizer is water vapor adsorbed inside the can. Experiments showed, however, that up to 40 g of molecular sieve was not effective in reducing the corrosion. Ignition experiments with corrosion products from unalloyed plutonium buttons showed that material to be combustible. In fact, when piled to sufficient depth on the button (about 1/8 in.), the corrosion product can burn when ignited by scratching the button. (Houser-ORNL)

WASTE PROCESSING IN THE CHEMICAL AND PETROCHEMICAL INDUSTRIES--A BIBLIOGRAPHY WITH ABSTRACTS, National Technical Information Service, Spring-

E. J. Lehmann.

Available from NTIS, Springfield, Va 22161 as COM-73-11386, Price \$20.00 printed copy; \$2.25 microfiche. NTIS Publication NTIS-WIN-73-022, June 1973. 87 p.

Descriptors: *Bibliographies, *Waste treatment, Abstracts, *Chemical wastes, *Oil wastes, *Industrial wastes, *Waste water treatment.

This bibliography on industrial waste treatment contains 87 selected abstracts of research reports. The reports included discuss control processes. economic factors and abatement strategies for the chemical and petrochemical industries. (Knapp-W74-12069

DOMESTIC WASH-WATER RECLAMATION USING AN AEROSPACE-DEVELOPED WATER

RECOVERY SUBSYSTEM,
National Aeronautics and Space Administration,
Langley Station, Va. Langley Research Center. I. B. Hall. Ir.

Available from NTIS, Springfield, Va 22161 as NY3-31913, Price \$3.00 printed copy; \$2.25 microfiche. Technical Memorandum X-2896, September 1973. 24 p, 3 fig, 5 tab, 7 ref, 2 append.

Descriptors: *Water reuse, *Reclaimed water, *Distillation, *Waste water treatment, Water purification, Potable water.

A prototype distillation system for water recovery designed for aerospace use, was tested to determine its capability to recover potable water from domestic wash water. A total of 26.25 gallons of domestic wash water was processed over a 7-day period at an average process rate of 3.85 gallons per day. The subsystem produced water that met all United States Public Health Standards for drinking water. Average energy consumption was approximately 12.74 kilowatt-hours per gallon of water recovered. This condition represents a worst-case energy consumption since no attempt was made to recover heat energy in the subsystem. An ultraviolet radiation cell installed in the effluent line of the subsystem was effective in con-trolling coliforms within acceptable levels of drinking water. The subsystem recovered virtually 100% of the available water in the waste-water process. In addition, the subsystem removed 99.6% nd 98.3% of the surfactants and phosphate, respectively, from the wash water. (Knapp-USGS) W74-12073

COAST GUARD 20 MAN SHIPBOARD WASTE-WATER TREATMENT SYSTEM--PHASE 1, FINAL REPORT,

Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.

Available from NTIS, Springfield, Va 22161 as AD-764 558 Price \$4.25 printed copy; \$2.25 microfiche. Document No TWR-6231, Contract Report for Coast Guard Office of Research and Development, July 1972, 98 p, 32 fig, 15 tab. Coast Guard DOT-CG-12, 843-A.

Descriptors: *Waste treatment, *Waste water treatment, *Ships, *Sewage treatment, Water pollution control, Incineration, Waste disposal.

A shipboard waste treatment system for a crew of 10-20 was studied. A preliminary design for the prototype system is presented. The results of the laboratory model testing are analyzed and the alternative approaches compared for filter-incinerator and secondary treatment systems. The catalyzed electrolytic process provides rapid oxidation of dissolved organic material in the waste, producing an effluent low in BOD and suspended solids. (Knapp-USGS) W74-12083

STUDY RELATING TO THE USE OF A PROCESS CONTROL COMPUTER FOR A WATER TREATMENT PLANT IN FRANCE, Compagnie Generale des Eaux, Paris (France). For primary bibliographic entry see Field 5F W74-12119

COMPUTER USE IN US WATER AUTHORITY, Chicago Dept. of Water and Sewers, Ill. For primary bibliographic entry see Field 5F. W74-12120

THE COMPUTER SIMULATION OF THE OPERATION OF A BANK OF RAPID GRAVITY FILTERS, Water Research Association, Marlow (England).

D. W. Hilder

Waste Treatment Processes—Group 5D

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 79-84, 25-27 September 1973. 5 fig, 2 ref.

Descriptors: *Computer programs, *Simulation analysis, Control, *Weirs, *Water quality control, *Waste water treatment, *Filters, Gravity, Water quantity, Effluents, Water delivery, Operations research, Valves, Systems analysis. Identifiers: Filter plants, Influents, Backwashing.

computer simulation program has been developed from a suitable mathematical model to represent the operation of a bank of rapid gravity filters. The mathematical model accounts for the flows into the filters, the transient storage in the filters, the relationships between the heads and flows through the filters, and the effects due to backwashing. Different methods of filter control and operation can be simulated. This paper deals with the application of the simulation to a bank of sixteen filters and investigates two methods of operation: (1) as fixed rate achieved by influent weir control; and (2) as a variable declining rate system. An idealized system is considered. Simulation results are discussed. It is concluded that the two systems are identical, except for the methods in which water is delivered to the bank of filters. Moreover, water balance calculations show that the amount of water delivered by the system is the same in both cases, and the simulation assumes that the influent water quality is the same. (See also W74-12107) (Bell-Cornell) W74-12141

THE START-UP MODEL OF A RAPID SAND FILTER, Philips Forschungslaboratorium G.m.b.H., Ham-

burg (West Germany). primary bibliographic entry see Field 5F. W74-12146

SOME EXTENSION SERVICE CAPABILITIES, Georgia Univ., Athens. Cooperative Extension

For primary bibliographic entry see Field 6E. W74-12172

INFORMAL OPINIONS.

Food and Drug Administration, Washington, D.C. For primary bibliographic entry see Field 6E. W74-12173

MICROBIOLOGICAL INHIBITION TESTING

PROCEDURE, Weston (Roy F.), Inc., West Chester, Pa For primary bibliographic entry see Field 5A. W74-12189

EFFECT OF TEMPERATURE AND OXYGEN

PRESSURE ON CELLULOSE UTILIZATION BY THERMOPHILIC ORGANISMS, Rhode Island Univ., Kingston. Dept. of Chemical Engineering, and Rhode Island Univ., Kingston. Dept. of Microbiology.

S. M. Barnett, R. A. Romanelli, and C. W. Houston

Available from the National Technical Information Service as PB-235 839 \$4.50 in paper copy, \$2.25 in microfiche. Completion Report, July 1974. 101-31-001-3840.

Descriptors: Thermosphilic animals, *Fungi, *Cellulose, Dissolved oxygen, *Fermentation, Temperature, Pressure, *Waste water treatment, Growth rate.

Identifiers: Thermophilic organisms. *Thermophilic fungi, *Chaetomium thermophil, *Sporotrichum thermophile, *Thermoascus auranThree thermophilic celluloytic fungi, Chaetomium thermophile var. coprophile, Sporotrichum thermophile and Thermoascus aurantiacus were studied to determine the conditions for a high rate of cellulose degradation. The range of temperature over which good growth occurred was determined first in a temperature gradient incubator, the optimum temperature was then established in shake flask cultures. T. aurantiacus had the highest op timum growth temperature range (46-51C), whereas S. thermophile had the broadest range over which good growth occurred (36-43C). Optimum temperatures for the three organisms. aurantiacus, S. thermophile and C. thermophile were 48, 40 and 40C respectively. The effect of pressure on cellulose utilization, cell yield, growth rate and optimum growth temperature of the cellulolytic fungi Chaetomium thermophile var coprophile, Sporotrichum thermophile and Ther-moascus aurantiacus was studied in especially designed pressure vessels. The optimum and limitdesigned pressure vessels. The optimization and mini-ing growth pressures of these fungi were also determined. The effect of pressure per sc on the degree of polymerization was studied in uninoculated medium. Pressure above 75 psig was inhibitory to C. thermophile, while pressure above 90 psig was inhibitory to S. thermophile and T. aurantiacus. The growth and utilization of cellulose by S. thermophile and T. aurantiacus, however, increased under pressure and displayed a maximum between 30 and 45 psig. Pressure applied under growth conditions had no effect on cellulose depolymerization of cellulose of the three fungi; the optimum growth pressure was 40 psig. W74-12193

RECLAMATION OF WATER FOR REUSE IN CHANNEL CATFISH RACEWAY SYSTEMS, Memphis State Univ., Tenn. Dept. of Biology. For primary bibliographic entry see Field 5G. W74-12203

AN ELECTROCHEMICAL METHOD FOR REMOVAL OF PHOSPHATES FROM WASTE WATERS.

Dynatech Corp., Cambridge, Mass. S F Sadek

removal.

Water Pollution Control Research Series, (1970). 47 p, 23 fig, 8 tab, 10 ref. FWQA Program No. 17010--02/70, 14-12-405.

Descriptors: Phosphates, *Electrochemistry, *Waste water treatment, *Electrodes, Costs, *Electrolysis, Flotation, Sewage treatment, Ion exchange, Ion transport. *Phosphates Identifiers: Treatment costs.

Phosphates in waste water may be removed electrochemically utilizing sacrificial electrodes. The electrode metal is first dissolved by the flow of current then precipitates out, removing from solu-tion the phosphate ions. This removal is either dependent on chemical reaction of the metal cation and the phosphate anions or, possibly, on the ad-sorption of the phosphate by the metal hydroxide floc. Data on the phosphate removal was gathered using both aluminum and iron electrodes. Essentially complete removal was found to occur on using 300 coulombs/liter of charge flow with normal phosphate concentrations for both types of electrodes. Aluminum consumption averaged about 0.7 mass units per single mass unit of PO4 removed for essentially complete phosphate removal. This mass ratio was about 2 for iron electrodes. Treatment costs (excluding labor and filtration) have been estimated to be about 2.5 cents/1000 gal. and 8 cents/1000 gal. when using iron and aluminum electrodes respectively. Exploratory tests indicated that flotation by means of the hydrogen generated during the electrolysis may be used to remove suspended solids from raw age while phosphates are being removed.

EVALUATION OF POLYMERIC CLARIFICA-EVALUATION OF POLYMERIC CLARIFICA-TION OF MEAT-PACKING AND DOMESTIC WASTEWATERS, Metropolitan Sewer Board, St. Paul, Minn. K. D. Larson, and D. A. Maulwurf. Available from GPO Sup Doc as EP1.23:660/2-74-

Avanable from GPU Sup Doc as EPI.23:660/2-74-020, \$2.30; microfiche from NTIS, Springfield, Va 22161 as PB-235 900, MF\$2.25. Environmental Protection Agency, Technology Series EPA-660/2-74-020, April 1974. 197 p, 13 fig, 60 tab, 2 ref, 3 append. EPA Project 12130 EKK, Program Element 1BB037.

Descriptors: *Waste water treatment, Settling basins, *Polyelectrolytes, *Flocculation, Biochemical oxygen demand, Suspended solids. Identifiers: *Polyelectrolyte treatment, Packinghouse waste water, *Polymeric clarifica-tion, Chemical treatment, Ferric chloride treat-

Laboratory tests were conducted to determine which system of chemicals would be most effective on combined packinghouse and domestic waste. A dual system of chemicals was found which was effective in the treatment of this combined waste. This was a combination of ferric chloride and an anionic polyelectrolyte. This system was effective in forming a floc which would settle out under the dynamic conditions of the overloaded primary sedimentation tank. Treatment with this system could effectively reduce suspended solids in the effluent of the primary sedimentation tank over what could be achieved without the use of this dual system. This was demonstrated by running: (1) a parallel system of identical test and control tanks and, (2) full plant scale investigation for both test and control periods, kept as identical as possible. When full plant scale tests were run, laboratory data were collected from various sampling points throughout the plant during the test and control periods. A significant reduction of BOD and suspended solids was obtained in the primary sedimentation tanks and a change in efficiency was not observed on the trickling filters resulting in an overall reduction in these parameters in the effluent from the secondary sedimentation tank. The cost of chemically treating the combined 10 mgd of wastewater would be approximately \$45 per million gallons and would be less for strictly domestic wastes. (EPA) W74-12210

BRINE DISPOSAL TREATMENT PRACTICES RELATING TO THE OIL PRODUCTION IN-DUSTRY.

Oklahoma Univ. Research Inst., Norman. School of Civil Engineering and Environmental Science. G. W. Reid, L. E. Streebin, L. W. Canter, and J. R.

Copy Available from GPO Sup Doc as EP1.23:660/2-74-037, \$2.90; microfiche from NTIS, Springfield, Va 22161 as PB-235 886, \$2.25. Environmental Protection Agency Technology Series Report EPA-660/2-74-037, May 1974. 275 p. 28 fig, 16 tab, 68 ref, 5 append. EPA Project 14020 FVW, 14-12-873.

Descriptors: *Oil industry, *Brine disposal, *Cost analyses, Permits, Evaporation, Injection wells, Cost comparisons, *Waste water disposal, Waste disposal, *Waste treatment, *Alternative costs. State governments.
Identifiers: Brine disposal costs, State-permitted

brine disposal mechanisms.

Methodology is developed for the economic evaluation of environmentally acceptable brine disposal systems. Specifically, a procedure is presented for determining total unit costs of alternative systems. These are then compared in order to select the least expensive, legally-permitted disposal processes. A broad and simplified discussion of resources economics is included. Disposal mechanisms and disposal cost analyses are described. Methods are included for obtaining the necessary information for use in the analyses. A

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listing is made of state regulatory agencies and their roles in administering brine disposal policies. W74-12211

WASTE OIL RECYCLING AND DISPOSAL, Recon Systems, Inc., Princeton, N.J. N. J. Weinstein.

GPO Sup Available from EP1.23:670/2-74-052, \$4.00; microfiche from NTIS, Springfield, Va 22161 as PB-236 148, from MF2.25. Environmental Protection Agency, Cincinnati, Ohio, Technology Series, August 1974. 327 p, 9 fig, 42 tab, 88 ref, 7 append. 1BB041 ROAP 21AVJ/TASKS 09 & 21, 68-01-1870 and 68-

Descriptors: *Waste disposal, *Waste treatment, Fuels, Wastes, Pollution, Collection, *Oil wastes, *Oil pollution, *Recycling, Industrial wastes. Identifiers: *Waste crankcase oil, *Waste oil reefining, Waste industrial oil, Waste lube oil, Waste oil collection, Recovery and reuse.

Information was developed on sources and quantities of waste oils, current and potential recycle and disposal methods, and the environmental impact of these methods. In addition to an extensive literature search, surveys (of rerefiners, collectors and processors, the Pittsburgh Pennsylvania Metro area and Standard Industrial Classification groups) were conducted to develop information reported. (EPA) W74-12215

SOIL MODIFICATION FOR DENTRIFICATION AND PHOSPHATE REDUCTION OF FEEDLOT

Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences

A. E. Erickson, B. G. Ellis, J. M. Tiedje, C. M.

A. E. Erickson, B. O. Emo, Hansen, and F. R. Peabody.

Sup Doc Copy Available from GPO Sup Doc as EP1.23:660/2-74-057, \$1.60; microfiche from NTIS, Springfield, Va 22161 as PB-235 909, \$2.25. Environmental Protection Agency, Technology Series Report EPA-660/2-74-057, June 1974, 118 p, 9 fig, 24 tab, 10 ref. EPA Project 13040 FYK, Program Element 1BB039.

Dairy industry. Descriptors: Hogs, *Denitrification, *Aerobic treatment, Anaerobic conditions, *Soil treatment, Waste treatment, *Farm wastes, *Phosphates, Feed lots, Biodegradation, Pilot plants, *Waste water treatment.

Identifiers: Barriered landscape water renovation systems, Organi Phosphate fixation. Organic matter decomposition,

The efficiency of pilot-size Barriered Landscape Water Renovation Systems (BLWRS) to renovate flushed livestock waste was studied. The BLWRS is a modified permeable soil that has an aerobic zone for the filtering and oxidation of the waste and an anaerobic zone to which an energy source is added to create an environment for denitrification. Two pairs of BLWRS 0.008 ha. in size were constructed using a polyvinyl barrier to create the anaerobic zone and contain the effluent. Flush waste from swine or dairy cattle were applied on each pair of BLWRS. The waste effluents and BLWRS soil were periodically analyzed for nutrients, oxygen demand and pathogens. At manure loading rates of up to 122 t/ha. swine waste and 93 t/ha. of dairy waste, the BLWRS had an efficiency of 80% and 97% for nitrogen renovation, greater than 99% for phosphate and 93% for carbon. The oxygen demand dropped 50- to 100- fold. Under normal operating conditions, the pathogenic indicator organisms did not appear in the effluent. The BLWRS has been shown to be an efficient system for renovating large quantities of livestock waste and should be tested on a commercial scale with continuous monitoring. (EPA) W74-12216

LIQUID AEROBIC COMPOSTING OF CATTLE WASTES AND EVALUATION OF BY-PRODUCTS.

Chino Basin Municipal Water District, Cucamonga, Calif. F. Grant, and F. Brommenschenkel, Jr.

Copy available from GPO Sup Doc as EP1.23:660/2-74-634, \$0.95; microfiche from NTIS as PB-235 914. Environmental Protection Agency Technology Series Report EPA-660/2-74-034, May 1974, 50 p, 2 fig, 16 tab, 36 ref, append. EPA Project S801647 (13040 HPV), Program Element

Descriptors: *Farm wastes, *Aerobic treatment, *Byproducts, Economic feasibility, Biological oxygen demand, Chemical oxygen demand, Dissolved solids, *Waste treatment, Feasibility studies, Costs, Dairy industry.

Identifiers: Volatile solids, Thermophilic reactors,

Mesophilic reactors, Total dissolved solids, *Liquid composting.

The technical and economic feasibility was determined of treating dairy waste in a liquid state by a tandem thermophilic-mesophilic aerobic stabiliza tion process, more commonly described as liquid composting. Experimental apparatus were set up at an operating dairy. A large fraction of dairy manure is relatively resistant to rapid biological degradation even at thermophilic temperatures. Antithertical requirements of sufficient oxygen for maximum biological activity and minimum air flow to preclude the need for an external heat source could not be satisfied with the particular experimental apparatus when utilizing air as the oxygen source. Improved results were obtained with an oxygen-enriched air supply which pointed out the potential advantage of a pure oxygen system. Preliminary cost estimates for a liquid composting process to serve 500 cows were developed within the context of current dairy operation economics. The process is considerably more costly than current, conventional, composting, operations. The cost of the process is substantially above levels which could be maintained by dairy operations. W74-12222

PROJECTS. PURE ACTIVE WATERS RESEARCH.

New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 10C. W74-12234

CHATTANOOGA AREA REGIONAL COUNCIL OF GOVERNMENTS COMPREHENSIVE WATER AND SEWER STUDY: HAMILTON, ALKER AND CATOOSA COUNTIES, BOOK

Hensley-Schmidt, Inc., Chattanooga, Tenn. For primary bibliographic entry see Field 6A. W74-12242

NITROGEN REMOVAL AND PHOSPHORUS PRECIPITATION IN A COMPARTMENTAL-IZED AERATION TANK, New York State Dept. of Environmental Conser-

vation, Albany. C. Beer, and L. J. Hetling. February 1974. 23 p, 25 fig, 13 ref. EPA, 17050

Descriptors: *Waste water treatment, *Sewage treatment, *Activated sludge, *Pilot plant, *Denitrification, *Aeration, Municipal wastes, Treatment facilities, Treatment, Aerobic treat-ment, Water pollution control, Biological treatment, Flow control, New York. Identifiers: *Nitrogen removal,

*Phosphorus precipitation, Compartmentalized aeration tank, Flow equalization, Ferric chloride, Anoxic cell. With a view to the importance of the activated sludge process in the New York State water pollution program, the State of New York embarked in 1968 on a research and development program in the area of activated sludge. It was hoped that results of that program might help to operate existing activated sludge plants more efficiently and, perhaps, to develop modifications that could be incorporated in these plants for achieving greater removals of contaminants. It was also hoped that processes could be developed that would influence the design of plants not yet on the drawing board. As a vehicle for the research and development program drawn up, it was decided to construct an experimental sewage treatment plant that would serve one of the state's institutions, the Coxsackie Correctional Facility. A modification of the biological nitrogen removal process described by Wuhrman (W70-04764) was combined with the phosphorus removal process based on the addition of ferric chloride to the aeration tank of the activated sludge system as described by Thomas and Wildi (W73-07465). Good results were obtained in treating approximately 95,000 gallons per day of institutional sewage. A compartmentalized aeration tank (11 compartments) was used, with arrangement for aerobic treatment after denitrification and before final settling. The required ferric chloride addition for phosphorus elimination was much less than the stoichiometric requirement. (Poertner) W74-12243

THE ELECTRICAL PROCESS IN THE BREAK-ING OF DILUTE OIL-IN-WATER EMULSIONS. Georgia Inst. of Tech., Atlanta. High Temperature Materials Div.

C. Orr, Jr., and E. Y. H. Keng.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 908, \$3.00 in paper copy, \$2.25 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC-0674, June 1974. 15 p, 2 fig. 2 tab, 4 ref. OWRT A-049-GA(1). 14-31-0001-4010.

Descriptors: Water pollution control, *Zeta potential, Electrical properties, *Emulsions, *Oil-water interfaces, *Oil wastes, *Industrial wastes, Oily water, Separation techniques, Waste water treatment.

Identifiers: Oil-water emulsions, Grease, Wax.

Oils, greases, and waxes frequently occur in industrial waste waters as highly dispersed droplets. Simultaneously, soaps and detergents enter most waste waters from domestic and other sources. When the mixtures of waste particles in water, known as emulsions, come in contact with the soaps and detergents, they generally become quite stable. One way to break such emulsions and thereby separate out the wastes is to add chemicals that will cause the oil droplets to agglomerate into larger drops. The problem is to determine just which chemical and what quantity of that chemical is needed to induce a given emulsion to agglomerate (break). This study sought to assess the usefulness of electrical measurements, particularly the so-called zeta potential, in guiding the treatment process to chemicals and application rates that can break measured emulsions. When the zeta potential, which for a highly stable emulsion may be as negative as -0.090 volt, is made to approach -0.015 volt, the stability of the emulsion deteriorates rapidly. Past this point, oil-in-water emulsions often break spontaneously. The larger drops will than rise to the water surface and form a distinct oil layer that can be easily removed. Laboratory applications of various chemicals to emulsion samples and subsequent zeta potential measurement should thus provide a ready guide to those trying to remove oily waste water discharges. (James-Georgia Tech) W74-12343

Waste Treatment Processes—Group 5D

TREATMENT OF WASTE WATER FROM FISH AND SHELLFISH PROCESSING PLANTS,

Rhode Island Univ., Kingston, Dept. of Chemical Engineering. H. N. Knickle.

Available from the National Technical Informa-Available 10th the National Technical Information Service, Springfield, Va 22161 as PB-235 925, \$3.25 in paper copy, \$2.25 in microfiche. Completion Report, July 31, 1974. 35 p, 3 fig, 9 tab, 6 ref. OWRT A-048-RI(1). 14-31-0001-3840.

Descriptors: *Waste water treatment, Water pollu-tion, *Filtration, Reverse osmosis, Adsorption, *Chemical precipitation, Economics, *Food processing industry, *Industrial wastes, Effluents. Identifiers: Fish processing wastes, Shellfish processing wastes

Some of the simpler methods for treating liquid ef-fluent from fish and shellfish processing plants have been studied with particular emphasis on their effectiveness and economy. These include filtration, reverse osmosis, adsorption, and chemical precipitation. In addition, the wastewater from an operating shellfish plant has been characterized. Filtration and chemical precipitation both appear to be effective and economical treatment methods. W74-12346

PROCEEDINGS OF THE XV EUCEPA CON-FERENCE ON HARMONIZING PULP AND PAPER INDUSTRY WITH ENVIRONMENT, For primary bibliographic entry see Field 5G. W74-12400

A TOTAL PROCESS APPROACH TO WATER AND WASTE MANAGEMENT IN AN EXPAND-ING FINE PAPER MILL, Papeteries de Virginal (Belgium).

G. W. Ruth, and J. Catterall.
In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 143-159, 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Pulp wastes, *Solid wastes, *Sludge, Treatment facilities, Waste treatment, *Waste water treatment, *Waste purification, Water supply, Pulp and paper industry, Europe, Ion exchange, Filtration, Flocculation, Mixing, Flotation, Aeration, Landfills, Lime, Sumps, Effluents, Polyelectrolytes, Boiler feed water, Industrial water, Water conservation, Recirculated water.

Recirculated water, Water Conservation, Recirculated water, Identifiers: *Belgium, White water(Paper machine), Charleroi Canal(Belgium), Sennette River(Belgium).

A Belgian fine-paper and coated-paper mill (owned jointly by a U.S. and a British company) manufactures lightweight papers, especially optical character recognition (OCR) papers. It generates only enough steam for drying and space heating and no electric power. Boiler feed water form the Samette British is retreated with light papers. from the Sennette River is pretreated with lime and by ion-exchange. Additional water supply comes from the Charleroi canal since the mill expanded from 75-110 to 200-250 daily tons by replacement of one of the two older machines with a high-speed paper and coating machine. Machine white water flows through mesh screens into two specials camps equipped with submerged conservates. separate sumps equipped with submerged cen-trifugal pumps which deliver the effluent to the mixing chamber of an 85-ft clarifier where sulfuric acid and lime may be added. The center of the clarifier is equipped with a rake, raise-lower facili-ties, skirt, and flocculating turbines. The clarified effluent (with or without alum and polyelectrolyte addition) passes to an aeration basin having a 6-hp floating aerator and then is either discharged to the river or to a second chamber from which it can be recycled to the raw water sumps or discharged to the canal. Sludge from the clarifier is pumped to a thickener and to a vacuum drum filter and is disposed of by hauling to a landfill site. (See also W74-12400) (Brown-IPC) W74-12407

THE POLLUTION-FREE MILL: FACTS AND VISIONS.

Lekanders Ingenjorsbyra A.B., Alingas (Sweden).

K. E. Lekander.
In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, p 161-170, 1973.

Descriptors: *Pulp wastes, *Bleaching wastes, *Water pollution control, *Pollution abatement, *Waste water treatment, Waste treatment, Air pollution lution, Europe, Pulp and paper industry, Water conservation, Recirculated water, Water pollution sources, Sulfite liquors.

*Sweden, Condensates, Evaporator condensates, Barking(Debarking), Closed systems.

Since the Swedish pulp and paper industry is responsible for over half of the total organic matter discharged into streams, as well as for considerable emissions of atmospheric sulfur dioxide, a three-year study project was conducted during a three-year study project was conducted dunny 1970-1973 with the aid of about 100 scientific ex-perts and a \$6 million budget to focus on technologically feasible pollution control mea-sures. Several changes in the operating procedures and practices of mills are recommended, which should considerably reduce the pollution load from both kraft and sulfite mills. These changes are discussed and include, e.g., conversion from wet to dry debarking of pulpwood, stripping and reuse of evaporator condensates, and closure of the pulp cooking, washing, screening, and drying cycle. (See also W74-12400) (Brown-IPC) W74-12408

TREATMENT OF CONDENSATE,

Angpanneforeningen, Stockholm (Sweden).
O. Axelsson, and S. E. Jonsson.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 201-227, 1973. 15 fig, 10 tab, 8 ref.

Descriptors: Treatment facilities, *Pulp wastes, Condensation, Byproducts, Pollution abatement, *Waste water treatment, Waste treatment, Liquid waste water treatment, waste treatment, Equid wastes, Odor, Biochemical oxygen demand, Sulfite liquors, Alcohols, Costs, Operating costs, Water pollution control, Recycling, Recirculated water, Water reuse, Neutralization, Steam, Water vapor, Gases, Water pollution sources, Pulp and paper industry, Biological treatment. Identifiers: Kraft mills, *Sulfite pulp mills, *Condensates, *Evaporator condensates,

*Condensates, *Evaporator condensates, *Digester condensates, Digesters(Pulp mill), Evaporators, Furfural, Methanol(Methyl alcohol), Formic acid, Acetic acid, Spent pulping liquors.

Steam and vapor condensates from kraft and sulfite pulp mill digesters and evaporators are discussed with regard to reduction of BOD and odor emissions by various technological measures, notably neutralization of spent pulping liquors, recovery of by-products (such as methanol, furfural, and formic and acetic acids) from the conextraction of spent liquors, and recirculation of condensates to the acid-making (cooking liquor preparation) stage. The comparative costs of various treatment processes are also indicated. (See also W74-12400) (Brown-IPC) densates, biological effluent treatment, improved

SOME SYSTEMS DEVELOPED FOR POLLU-TION ABATEMENT IN THE PULP INDUSTRY, PARTICULARLY OXYGEN BLEACHING,

Mo Och Domsjo A.B., Ornskoldsvik (Sweden). I. Croon. In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environment; held in Rome, May 7 to 11, 1973, p 229-253, 1973. 24 fig.

Descriptors: *Water pollution control, *Pulp wastes, Pulp and paper industry, *Pollution abatement, Air pollution, *Bleaching wastes, Economics, *Costs, Oxygen, Oxidation, Effluents, Sulfur compounds, Odor, Europe, Canada, Water conservation, Industrial wastes, Waste treatment, Biochemical oxygen demand, Color, Toxicity.
Identifiers: *Kraft mills, Sweden, Debarking(Barking), *Oxygen bleaching, Pulp washing, Condensates, Gas scrubbing, Closed systems.

Recent developments in oxygen bleaching of pulp promise to reduce not only the BOD, toxicity, and color of bleach plant effluents but also the total volume of aqueous discharges from pulp and paper mills. Further aids to the reduction of water pollution include dry debarking of pulpwood logs, closed-circuit screening and countercurrent washing of pulp, and treatment of condensates from digesters and evaporators. By converting to ox-ygen bleaching sequences in conjunction with steam stripping of condensates, a kraft pulp mill may eliminate 65% of its effluent BOD and 70% of may eliminate 65% of its effuent BOD and 70% of the color load while saving at least \$5 per ton of pulp in chemical costs, without affecting the quality of the pulp produced. Odiferous sulfur emissions from various sites in the mill can be collected, scrubbed, and/or subjected to thermal ox-idation. Black liquor (spent alkaline pulping liquor) can be oxidized to minimize reduced sulfur com-pounds (such as mercaptans and hydrogen sulfide) in flue gases from direct-contact evaporators. The in riue gases from direct-contact evaporators. The main sources of sulfur dioxide emissions is the recovery furnace stack. They can be minimized by scrubbing flue gases with alkaline solutions. The MoDo scrubber combines this process with heat recovery. Progress along these lines Mo och Domisica AD in Suedon and by Chemetica Ltd. in sjo AB. in Sweden and by Chemetics Ltd. in Canada is emphasized. (See also W74-12400) (Brown-IPC)

PULP MILL WATER SYSTEM CLOSURE, Swedish Forest Products Research Lab.,

Stockholm.

N. Hartler.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 267-281,

Descriptors: *Water reuse, *Water conservation, *Industrial water, *Recirculated water, *Water pollution control, *Pollution abatement, *Pulp and paper industry, Pulp wastes, Effluents, treatment, Waste water treatment, Operation and maintenance, Bleaching wastes. Identifiers: Closed systems, Pulp mills, Un-bleached pulps, Bleached pulps.

The closure of pulp mill water circuits is attractive for several reasons, including pollution abatement, freshwater conservation, and reduced fiber losses. Key points in closed production lines and some of the attendant problems are discussed, viz., (1) screening as an integral part of pulp washing; (2) cleaning and/or recycling of condensates; (3) system closure within and between filter washing system closure within and between filter washing stages; (4) cooking of pulpwood to higher delignifi-cation degrees; (5) replacement of Cl by chlorine dioxide; (6) separation of free chloride from or ganic substances; (7) secondary effluent treat-ment; and (8) leakage and accidental disturbances. ment; and (8) leakage and accidental disturbances. System closure is approaching practical fulfillment for unbleached but not yet for bleached pulp manufacturing lines on which further research is needed. (See also W74-12400) (Brown-IPC) W74-12411

ESTABLISHMENT OF A CLOSED SYSTEM FOR THE PAPER MAKING PROCESS, T. Franzen, C. Heinegard, S. Martin-Lof, C. Soremark, and D. Wahren.

Group 5D-Waste Treatment Processes

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 311-336, 1973. 14 fig, 2 tab.

Descriptors: *Pulp wastes, *Pollution abatement, *Water pollution control, *Recirculated water, *Water purification, *Waste water treatment, Pulp and paper industry, Recycling, Economics, Discharge(Water), Slime, Operation and maintenance, Equipment, Temperature, Water proper-ties, Industrial water, Effluents. Identifiers: Closed systems, Paper machines, White water(Paper-machine), Papermaking.

Internal system closure represents one alternative measure for pollution abatement in paper mills. Such measures have several advantages over external effluent treatment method, provided that care is taken to avoid impairment of operating conditions and/or of product quality. Experience gained in many paper mills with the full or partial closure of the white water circuit has shown that a substantial part of conventionally discharged pollutants can be excluded from effluents and reused in paper products without negative effects. In many instances, such system closures have improved not only the mill's operating conditions, such as paper machine drainage and minimized slime deposits, thanks to increased water temperatures, but also the optical and mechanical proper-ties of the paper sheet. Moreover, savings in fiber consumption and heat supply amounting to \$10 to \$15 per ton of paper can be realized by various circuit-closing measures, such as recirculation of internally cleaned white water as shower, cooling, and sealing water. An appendix gives calculations of the materials balance and discusses the concentration relationships resulting from a white water system closure. (See also W74-12400) (Brown-IPC) W74-12412

DESIGN PRINCIPLES OF WHITE WATER SYSTEMS WITH SPECIAL REFERENCE TO EFFLUENT CONTROL,

Jaakko Poyry and Co., Helsinki (Finland) P. Aaltonen, M. Nyyssola, and S. Von Troil. In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environment; held in Rome, May 7 to 11, 1973, p 337-349, 1973. 2 fig. 2 tab.

Descriptors: *Water conservation, *Industrial water, *Waste water(Pollution), *Recirculated water, *Pulp wastes, *Pulp and paper industry, Freshwater, Design, Equipment, Monitoring, Suspended solids, Colloids, Dissolved solids, Water pollution control, Pollution abatement,

Design criteria.

Identifiers: Paper machines, Fourdrinier machines, Sheet formers(Paper-machine), Closed systems, White water(Paper-machine).

Basic principles for designing process water circuits for a fourdrinier paper machine are discussed, notably the controlled use of freshwater, observations of stock and water system dynamics, and monitoring of suspended, dissolved, and colloidal materials. The presence of more than one machine or modern nonfourdrinier sheet formers in a single mill may alter the system design. (See also W74-12400) (Brown-IPC)

FRACTIONAL INPLANT TREATMENT OF RECYCLE FLOWS BY ADVANCED TECHNIQUES,

Institute of Paper Chemistry, Appleton, Wis. A. J. Wiley.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environment; held in Rome, May 7 to 11, 1973, p 351-362, 1973. 5 fig, 1 tab, 9 ref. Descriptors: *Waste water treatment, *Pulp wastes, *Bleaching waters, *Recirculated water, *Water conservation, *Treatment facilities, *Reverse osmosis, Membrane processes, Adsorp tion, Activated carbon, Electrodialysis, Freeze drying, Filtration, Flotation, Pulp and paper industry, Industrial water, Water purification, Waste water(Pollution), Recycling.

Ultrafiltration, Identifiers: Woodrooms(Pulp mill), Bleach plants(Pulp mill), Pulp washing, Paper machines, Papermaking, Pulp

mills. Paper mills

The papermaking process can be divided principally into five main unit operations, viz., the woodroom, the pulp mill, the pulp washing plant, the bleach plant, and the machine room, each comprising facilities for water processing, such as clarifiers, pulp presses, drum filters, washing presses or filters, and flotation savealls. The total system design principle, however, calls for recycling of waste waters from later to earlier stages after appropriate purification. Novel technological approaches under investigation include reverse osmosis, ultrafiltration, activated carbon adsorption, electrically drive membrane processes (such as electrodialysis), and freeze concentration. Work performed particularly on reverse osmosis at the Institute of Paper Chemistry is reported. (See also W74-12400) (Brown-IPC)

CLARIFICATION OF WHITE WATER BY VACUUM FILTRATION (KLAERUNG VON WEISSWASSER DURCH VAKUUM-FILTRA-TION), R. F. Kozich.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 363-376, 1973. 13 fig.

Descriptors: *Water treatment, *Waste water treatment, *Filtration, *Pulp wastes, *Industrial water, Pulp and paper industry, Water purifica-tion, Waste treatment, Additives, Flotation, Slime, Foaming, Operation and maintenance, Recirculated water, Water conservation, Equip-

ment, Design, Design criteria.

Identifiers: Paper machines, White water(Papermachine), Paper additives, Closed systems.

Factors affecting the design of white water (paper machine) circuits are discussed, including water volume, retention of fillers and fines (fine fibers), beating degree, filter aids, mineral (ash) content, and paper grades. Advantages of vacuum filtration over other white water purification processes are outlined. They include ready adaptation to dif-ferent paper machines and paper qualities; elimination or minimized use of flocculants or other chemical additives; lower foam (gas) content in the machine headbox than with flotation savealls; fewer organic flock and slime deposits; insensitivity to changes in water influx; operation with little supervision; reduced space requirements; and reuse of treated white water as shower spray (Brown-IPC) water. (See also W74-12400)

EFFECTS OF RAW MATERIALS AND CHEMICAL ADDITIVES ON MILL EFFLUENT

Research Association for the Paper and Board. Printing and Packaging Industries, Leatherhead

W. G. Cobett, R. A. Granville, and R. D. Isabell. In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 377-391, 1973. 1 fig, 6 tab, 7 ref.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Water pollution control, *Pollution abatement, *Additives, *Chemicals, Pulp and

paper industry, Effluents, Suspended solids, Dissolved solids, Waste water treatment, Waste treatment. Industrial wastes. Costs. Pollutants. Water conservation, Water reuse, Recirculated water. Identifiers: Waste papers, Retention aids, Stock preparation(Pulp), Paper additives.

The most logical first step toward reduced water pollution at a pulp or paper mill is to maximize water recirculation and thus cut the freshwater intake. This will both simplify the task and lower the costs of removing suspended solids and BOD from effluents. For maximizing treatment cost savings, the reduction of water pollution achieved should be judged in terms of load (kg/day) rather than of concentration (mg/liver). The solubles in paper mill effluents derived from wood pulps are not greatly affected by variations in stock preparation and cannot be substantially reduced by common procedures. However, the appropriate choice of chemical additives, such as beater and surface sizing agents, may improve the retention of water solubles in the sheet and lessen the effluent BOD load. Despite this judicious selection, high pollution loads will still arise from contaminants in poorer grades of waste paper furnishes. The use of low-BOD additives, such as carboxymethylcellulose, may provide only temporary relief, since stricter demand by pollution control authorities may pose the later problem of removing these ad-ditives from the effluent. Details are reported of research studied conducted by PIRA on sources of BOD in different kinds of wood pulps (mechanical, sulfite, kraft, neutral semichemical sulfite, softwood, hardwood, etc.) and various furnish additives, such as rosin size, alum, oxidized starch, cationic starch, and the like. (See also W74-12400) (Brown-IPC)

MECHANICAL TREATMENT OF PULP AND PAPER MILL EFFLUENT, Nevalainen and Orivuori, Helsinki (Finland).

J. Kolionen.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 435-448, 1973. 1 fig, 3 tab.

Descriptors: *Treatment facilities, *Pulp wastes, *Waste treatment, *Waste water treatment, *Suspended solids, *Costs, *Economics, *Capital costs, *Operating costs, *Sludge treatment, Discharget(Water), Waste water(Pollution), Filtration, Centrifugation, Flotation, Effluents, Energy, Sludge disposal, Liquid wastes, Solid wastes, Industrial wastes, Pulp and paper industry, Europe, Water pollution sources, Water pollution control, Pollution abatement. Identifiers: Kraft mills, Sulfite mills, Woodrooms,

Barking(Debarking), Finland.

The screening and clarification of kraft and sulfite pulp mill barking room (woodroom) effluents by mechanical methods such as flotation, filtration, and centrifugation are discussed, including treatment and disposal of the resulting sludges. Investment and operating costs of mechanical processes depend on the quality and quantity of effluents, the allowable suspended solids content of the treated discharges, the space available for treatment facilities, and sludge handling problems. For large Finnish mills with maximum allowable discharges of 8 to 15 kg suspended solids per tone of product, the removal of 1 ton suspended solids per day requires a capital investment of ca. \$120,000 and a total expense (with 6% interest over 20 years) of 0.5 cent per cu m of effluent treated, provided that no chemical flocculants are needed. The energy demand of mechanical treatment installations is about 20 kw per ton of suspended solids removed daily. (See also W74-12400) (Brown-IPC) W74-12418

Waste Treatment Processes—Group 5D

THE USE OF SILICATES AND POLYELEC-TROLYTES FOR FLOCCULATION, Papiripari Vallalat Kutato- es Fejlesztointezete,

Budapest (Hungary).
P. Lengyel, K. Engelhoffer, and J. Papp.

In: Proceedings XV EUCEPA Conference on Har-monizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 491-503, 1973. 6 fig, 4 tab, 7 ref.

Descriptors: *Waste water treatment, Waste treatment, *Pulp wastes, Additives, *Suspended solids, *Chemical oxygen demand, *Silicates, Clays, Montmorillonite. Zeolites, Clays, Monation Institute, Polyelectrolytes, *Floculation, Sedimentation, Chemical precipitation, Colloids, Aluminum, Ion exchange, Kaolinite, Bentonite, Kaolin minerals, Hydrogen ion concentration, Neutralization, Effluents, Sludge, Recycling, Water pollution control, Pollution abatement.

Identifiers: *Alum(Aluminum-potassium sulfate), Waste paper, Swelling, Swellability, Specific surface, Surface area.

The characteristics and purification of mill effluents are discussed with special reference to a paper mill in which large amounts of waste paper fibers are recycled. Laboratory studies are re-ported concerning the effects of alum, silicates, and polyelectrolytes on the COD and sediment solids content of paper-machine waste waters (white waters). Silicate additives (including sodium carbonate-activated bentonites, kaolins, and zeolites) were tested for montmorillonite content, ion-exchange capacity, swellability, and specific surface area in order to seek relationships between these characteristics and the effluent-purifying efficiency of the compounds. Also determined were those alum levels required to give a sediment-free effluent and beyond which no significant further COD reduction was evident. It was found that a part of the alum needed to remove colloidal and suspended solids could be replaced by certain sil-icates while keeping the pH of the clarified water neutral, so that no further pH adjustment was necessary prior to discharge or recirculation of ef-fluent waters. A relationship was also found between the physical characteristics of silicates on one hand and the sedimentation rate of suspended solids and the sludge volume produced on the other hand. (See also W74-12400) (Brown-IPC) W74-12420

THE BIOLOGICAL PURIFICATION OF FALSE INDUSTRY WASTE WATERS (DIE BIOLOGISCHE REINIGUNG VON RESTAB-WAESSERN DER PAPIERINDUSTRIE), WAESSERN DER PAPIERINDUSTRIE), Attisholz A.G., Luterbach

(Switzerland).

A. Scherler.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 505-521,

Descriptors: *Biological treatment, *Pulp wastes, Treatment facilities, Waste treatment, *Waste water treatment, *Pollution abatement, Economics, *Operating costs, Costs, Sludge treatment, Biochemical oxygen demand, Oxidation,

Biodegradation. Identifiers: Attisholz process(Effluent treatment).

After a review of the four main types of available biological treatment processes (trickling filters, total oxidation, and single- and two-stage sludge), the design and operation of the two-stage Attisholz process are discussed in some detail. This treatment is said to operate most economically, i.e., at a total cost of ca. 15 Swiss francs per ton of product (including capital interest, sludge utilization, and preclarification) while reducing effluent five-day BOD to ca. 0.4-kg per ton of paper. (See also W74-12400) (Brown-IPC) also W74-1: W74-12421

TERTIARY METHODS OF WASTE TREAT-

Balfour-Italia, Rome (Italy).

J. R. Simpson, G. A. Truesdale, and L. Baruchello.
In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment, held in Rome, May 7 to 11, 1973, p 523-533, 1973. 1 tab. 3 ref.

Descriptors: *Tertiary treatment, *Waste treatment. *Waste water treatment, *Pulp wastes, Biochemical oxygen demand, *Suspended solids, *Capital costs, Costs, Treatment facilities, *Filters, *Filtration, Bacteria, Irrigation, Soil *Filters, disposal fields, Lagoons, Biological treatment, Pulp and paper industry, Effluents. Identifiers: Microstrainers, Immedium filter, Si-

mater filter.

After full-scale biological treatment of effluents to at least 20 mg/liter of BOD and 30 mg/liter of total suspended solids (TSS), residual objectionable constituents may require further treatment. Such tertiary processing cannot be justified solely for improving the effluent quality of an inefficient secondary treatment system, since the capital costs for achieving ultimate BOD and TSS values of 10 and a final ammonia N content of 3.5 mg/liter are 25% higher than those for BOD reduction to 20 and TSS reduction to 30 mg/liter. Various tertiary and 155 reduction to 30 m/met. Various tertiary polishing methods are compared, including irriga-tion over grasslands, lagooning, slow and rapid gravity sand filters, 'Immedium' upward-flow and 'Simater' radial-flow sand filters, microstrainers, gravel-bed clarifiers, and bacteria removal. (See also W74-12400) W74-12422

ACTIVATED CARBON AND TECHNIQUES FOR COLOR REMOVAL FROM KRAFT MILL EFFLUENTS.

Saint Regis Paper Co., Pensacola, Fla.
W. G. Timpe, and E. W. Lang.
In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 535-557, 1973. 10 fig, 8 tab, 32 ref.

Descriptors: *Activated carbon, *Pulp wastes, *Waste water treatment, *Bleaching wastes, *Biological treatment, Color, Reverse osmosis, Ion exchange, Lime, Lignins, Membrane processes, Biochemical oxygen demand, Pulp and paper industry, United States, Water consump-tion(Except consumptive use), Suspended solids, Dissolved solids, Costs, Operating costs, Water reuse.

Identifiers: Alum(Aluminum-potassium sulfate),

Kraft mills.

Of the 2100 billion gal of water consumed annually by the U.S. paper industry 1500 billion are used by the kraft industry. Manufacture of kraft paper requires 10,000 to 60,000 gal (average 27,000 gal) of water per ton. Effluent contaminant range from truly dissolved to suspended materials. Clarifica tion and bio-oxidation processes can remove all suspended solids and 90% of the 5-day BOD in modern mills. Effluent color (light to dark brown, exceeding 500 APHA color units) represents about 50% of dissolved organics and is caused mainly by black liquor lignin (representing 2-7% losses from the system) and by lignin degradation products formed during pulp bleaching. In the U.S.A. five commercial lime treatment systems operated on kraft and mixed effluents for color removal, which ranges from 60 to 95% at a lime pH of 11.5 or above. Although alum can remove color at pH 5-6 more effectively than lime, its use is burdened by sludge handling and chemical recovery problems. Reverse osmosis through cellulose acetate membranes can achieve high color removals, but is presently uneconomical for kraft effluents. Crossflow ultrafiltration through dynamically formed membranes at lower applied pressures can remove up to 99% of color, but is still in laboratory development stages. Some success has been achieved also with ion-exchange of bleach plant effluents. Pilot plant trials gave color removals to below 10 C.U. from unbleached kraft effluents and produced reuseable water by passage through mul-tiple carbon columns after lime pretreatment. Costs of this process are less than for carbon treatment preceded by bio-oxidation and clarification (or by clarification alone) where discharged water quality requires 90% of BOD removal and color removal to 200 C.U. or less. A new carbon contact technique with still better economy is under development. (See also W74-12400) (Brown-IPC) W74-12423

NEW FINE PARTICLE TECHNOLOGIES AP-PLIED TO THE ENVIRONMENTAL PROBLEMS OF THE PAPER INDUSTRY, English China Clays Ltd., Saint Austell (England).

N O Clark

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 559-571, 1973. 8 fig. 1 tab.

Descriptors: *Sludge treatment, *Sludge disposal, *Particle size, *Solid wastes, *Liquid wastes, *Industrial wastes, *Pulp wastes, *Waste treatment, *Separation techniques, Equations, Darcys Law, Stokes Law, Clays, Calcium carbonate, Flocculation, Polyelectrolytes, Chemical Flocculation, Polyelectrolytes, Chemical precipitation, Water pollution control, Pulp and paper industry. Identifiers: Kynch equation, Poiseuille equation,

Talc. Polacrylamide.

Pollution by solids or liquids is easier to control than is the processing of sludges which require separation into a solid and a liquid phase. The paration of fine particles involves four theoretical equations, namely, Stoke's, Kynch's, Darcy's, and Poiseuille's Laws. The application of these physical-engineering principles to the practical removal or recovery of minerals, such as clays, tale, and calcium carbonate, is discussed and illustrated, including the use of retention and flocculation aids, such as polyacrylamide. (See also W74-12400) (Brown-IPC) W74-12424

A STUDY OF THE EFFLUENT TREATMENT FROM AN ITALIAN PAPER MILL,

Cartiera del Timavo, Trieste (Italy). R Ferretti

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 573-584,

Descriptors: *Pulp wastes, *Treatment facilities, Europe, Biochemical oxygen demand, Suspended solids, Flocculation, Filtration, Coagulation, Chemical precipitation, Bentonites, Aluminum, Polyelectrolytes, Filtration, Effluents, Waste treatment, *Waste water treatment, *Pollution treatment, "waste water treatment, "Foundament abatement, Pulp and paper industry, Water pollution control, Industrial wastes. Identifiers: Alum(Aluminum-potassium sulfate), White water, "Italy.

Antipollution treatments applied by an Italian groundwood pulp, newsprint, and printing paper mill to minimize BOD loadings and total suspended solids in its aqueous effluents are discussed and illustrated. Depending on the varying characteristics of discharges (from the barker room, grinder room, wire and felt showers, washing and cooling waters, etc.), the facilities provide a range of simple to sophisticated mechanical and chemical treatments, from decanters and barkbased filter basins to chemical flocculation and coagulation with alum, bentonite, and/or polyelectrolytes. Maximum BOD and suspended solids discharges of 20-30 ppm are reported. (See also W74-12400) (Brown-IPC) W74-12425

Group 5D—Waste Treatment Processes

THE ROLE OF THE CHEMICALS USED IN PAPER AND PAPER BOARD MAKING IN MINIMISING EFFLUENT PROBLEMS, Imperial Chemical Industries Ltd., London

Imperial Chemical Industries Ltd., (England). For primary bibliographic entry see Field 5G. W74-12427

SYSTEM OF COMBINED AND PROFOUND TREATMENT OF PULP AND PAPER INDUSTRY WASTE WATERS WITH ACTIVATED SLUDGE,

Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi

Promyshlennost, Moscow (USSR).
N. A. Evilevitch, M. A. Lomova, M. M.
Nikiforov, B. S. Pritsker, and A. Ya. Tipisev.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 763-767,

Descriptors: *Treatment facilities, *Pulp wastes, *Activated sludge, *Aeration, *Biodegradation, Foreign research, *Biological treatment, Aerated lagoons, Waste water treatment, Waste treatment, Industrial wastes, Pulp and paper industry, Oxidation, Organic loading, Biochemical oxygen de-mand, Nutrients, Phosphorus, Nitrogen, Nitrogen compounds, Phosphorus compounds, Microorganisms, Equipment.
Identifiers: *USSR, Aerators, Multistage

processes.

A modified three-stage activated sludge process is outlined, which avoids most of the disadvantages of conventional biological effluent treatment systems. Partial removal of oxidized pollutants in first-stage equalizers is followed by high-rate ox-idation (2000-3000 g/cu m/day) in a second stage equipped with mechanical aerators which remove 70-80% of the BOD load at a BOD:N:P nutrient ratio of 100:4:1. Final 'profound' (in-depth) treatment with specific microfloral cultures occurs in third-stage high-load aeration ponds equipped with self-suction type aerators. (See also W74-12400) (Brown-IPC) W74-12428

A PILOT PLANT STUDY FOR THE TREAT-MENT OF PAPERMILL AND DEINKING EF-FLUENTS,

American-Israeli Paper Mills Ltd., Hadera (Israel). L. Rakosh.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 769-780, 1973. 5 fig, 5 tab, 2 ref.

Descriptors: Treatment facilities, *Pilot plants, *Waste water treatment, *Pulp wastes, *Waste treatment, Pulp and paper industry, *Water reuse, water conservation, Recirculated water, Irrigation, Flocculation, Activated sludge, Suspended solids, Turbidity, Industrial water, Biochemical oxygen demand, Biodegradation, Organic loading, Recycling, Discharge(Water), Waste water(Pullution) Sodimentation

Recycling, Discharge(Water), Waste water(Pollution), Sedimentation. Identifiers: White water, *Israel, De-Inking wastes, Waste paper, Attisholz process, Paper machines, Paper mills.

An Israeli paper mill which, until recently, discharged its untreated effluent into a local stream, has installed a new treatment facility comprising primary sedimentation followed by two-stage activated sludge treatment in an Attisholz (Swiss-developed) pilot unit which handles the combined white waters from two paper machines producing offset printing, kraft wrapping, and newsprint papers. At volumetric loadings of 3-4 kg of BOD per day per cu m of aeration volume, low turbidities (suspended solids) were achieved with some flocculant addition to the second stage. Without biological treatment, 7 to 20 times as much flocculant would have been needed. At higher pollution loads of 6-8 kg BOD, the same turbidities were obtained without flocculants. Deinking effluent (from waste paper deinking) was readily biodegradable. The process responded well to frequent changes in water composition resulting from paper grade changes, and to variations in pollution load. The treated effluent could be recirculated or disposed of as irrigation water. (See also W74-12400) (Brown-IPC) W74-12429

RECENT DEVELOPMENTS IN PAPER MILL EFFLUENT TREATMENT IN FRANCE (DEVELOPPEMENTS RECENTS DU TRAITE-MENT DES EFFLUENTS DE PAPETERIE EN FRANCE),

Societe Degremont, Paris (France).

P. Treille.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 781-796, 1973, 9 fig. 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Waste treatment, *Treatment facilities, Equipment, Europe, Pulp and paper industry, Effluents, Flotation, Flocculation, Turbulent flow, Electric fields. Identifiers: *France.

Illustrated descriptions and examples of practical applications in the paper industry are given for three effluent-treatment units marketed by the French Societe Degremont, viz., a 'turbocirculator', a 'flotator', and an 'electro-floculator' (See also W74-12400) (Brown-IPC)

AN INTERESTING METHOD OF ABATING POLLUTION IN THE PULP AND PAPER IN-DUSTRY, Ecolgenova, S.p.A., Genoa (Italy).

G. Mortola

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 797-803, 1973. 4 fig, 1 tab.

Descriptors: Treatment facilities, Equipment, *Pulp wastes. *Sedimentation, *Coagulation, Descriptors: Treatment faculues, **Pulp wastes, *Sedimentation, *Coagulation, *Suspended solids, *Filtration, *Sludge, Nitrogen compounds, Phosphorus compounds, Pulp and Waste water treatment, Waste paper industry, Waste water treatment, treatment, Activated sludge, Sepa sludge, Separation techniques. Identifiers: *Seclar(Clarifier).

The operation and practical application to a paper mill effluent of the Seclar sedimentation-coagula-tion unit are described and illustrated. The clarifier separated suspended solids by upward filtration through a floating blanket of sludge. The unit can be used as primary or secondary settling tank in activated sludge processes. It is suited also for removal of N and P compounds. (See also W74-12400) (Brown-IPC) W74-12431

METHOD FOR TREATING OIL-CONTAINING WASTES, M. Ohta.

U.S. Patent No 3,809,631, 2 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 922, No 1, p 274-275, May 7, 1974.

Descriptors: *Patents, *Industrial wastes, *Oil wastes, *Electrolysis, *Pollution abatement, Water quality control, Water pollution control, *Waste water treatment, Oily water.

Industrial wastes containing oils and surfactants are treated by adjusting the pH of a waste to 3 or less. The waste is then subjected to electrolytic treatment wherein the oil phase is separated out. In the first-stage electrolytic treatment a titanium-lead oxide composite electrode is employed as an acid-resistant anode. The remaining waste water is again subjected to electrolysis. This time the elecagain subjected to electroysis. Inis time the elec-trodes are composed of aluminum thereby precipitating the surfactants as sludge separated from water. (Sinha-OEIS) W74-12433

PROCESS FOR REMOVING CHROMIUM FROM COOLING TOWER BLOWDOWN FROM C STREAMS.

Texas Gulf, Inc., New York.

A. Gloster, and H. G. Bocckino. U.S. Patent No 3,810,542, 4 p, 3 fig. 5 ref; Official Gazette of the United States Patent Office, Vol 922, No 2, p 522, May 14, 1974.

Descriptors: *Patents, Pollution abatement, *Cooling towers, *Chromium, *Industrial wastes, *Waste water treatment, Water pollution control, Water quality control, Acid streams. Identifiers: Chemical treatment.

A procedure for combining the streams from a cooling tower and an acid plant scrubbing tower to reduce the pollution problems of these industrial waste water is disclosed. The cooling tower stream is characterized by the presence of chromium products in which the chromium is in the hex-avalent state, such as chromic acid or a chromate salt which are common corrosion inhibitors in cooling waters. The acid plant scrubbing tower has an acidic component such as sulphur dioxide dissolved in water. By combining these two streams the hexavalent chromium under acidic conditions is converted to trivalent chromium. The combined streams are then neutralized to precipitate chromium hydroxide and other compounds which are undesirable in the effluent. After settling out the chromium hydroxide and other compounds the waste stream may be discharged without present-ing a pollution problem. (Sinha-OEIS) W74-12434

MOBILE PURIFYING PLANT FOR WASTE

WATER, Aktiebolaget Gustavsbergs Fabriker (Sweden). (assignee)

B. O. Lundqvist

U.S. Patent No 3,810,543, 3 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 922, No 2, p 522, May 14, 1974.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Pollution abatement, Water pollution control, Water quality control, *Water purification, Aluminum sulphate, Separation techniques.

A purifying plant for waste water consists of a mobile housing of a size to be transported on public highways. The housing contains means for the biological purification of the waste water, means for mixing aluminum sulphate into the biologically purified water, a separator to separate the deposited particles from the water, and a tank to collect the particles separated in the separator. The various apparatuses are situated at one wall of the housing, so as to create a compact plant. (Sinha-OEIS) W74-12435

ELECTROLYTIC FLOTATION,

Simon-Hartley Ltd., Stoke-on-Trent (England).

U.S. Patent No 3,817,865, 2 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 1068, June 18, 1974.

Descriptors: *Patents, *Flotation, *Electrolysis, *Activated sludge, *Waste water treatment, Pollution abatement, Water pollution control, Electrodes, Gases, Bubbles, Equipment, Effluent.

In the flotation apparatus, the liquid to be treated is caused to flow through a tank equipped with at

Waste Treatment Processes—Group 5D

least one electrode assembly. Gas bubbles are generated by electrolytic action. The gas bubbles cause suspended matter to rise to the surface of the tank to be skimmed off for removal. The removal device comprises endless chains sup-ported on sprocket wheels at opposite sides of the tank. The chains are driven so that scraper blades remove the thickened material for disposal into a suitable waste collector. (Sinha-OEIS) W74-12439

METHOD FOR TREATING WASTE WATERS, Fried-Krupp G.m.b.H., Essen (West Germany).

U.S. Patent No 3,817,862, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 1068, June 18, 1974.

Descriptors: *Patents, *Filtration, *Waste water Descriptors: "atents, "Intration, "waste water treatment, "Organic wastes, "Aeration, "Chemical oxygen demand, Pollution abatement, Water quality control, Water pollution control, Activated carbon, Ion exchange, Carbon.

Waste water containing emulsified and dissolved, oxidizable, organic substances is added to a catalyst selected from a group consisting of carbon and ion exchangers. Air is forced through the resulting mixture, increasing the interfacial area between them. The treatment is discontinued when the chemical oxygen demand and perman-ganate consumption values have been reduced. The treated mixture is then filtered through a bed of activated carbon. (Sinha-OEIS)

METHOD OF COAGULATING SUSPENDED SOLID IMPURITIES IN WATER WITH SILICONE-SILICA COMPOSITIONS,

G. M. J. Slusarczuk, and J. F. Brown, Jr. U.S. Patent No. 3,817,861, 10 p, 8 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 1068, June 18, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, *Flocculation, Electrolytes, Suspended solids, *Coagulation.
Identifiers: Silicic acid, Silane, Silicone, Biocol-

Water-dispersed compositions have been prepared by contacting 'soluble silica' with a hydrolyzed carbon-functional silance. The macromolecular structure present in this composition may consist of silicic acid polymer molecules, the outer surfaces of which are partially covered with cationic silicone molecules attached thereto. One specific silicone molecules attached thereto. One specific system that has been found to produce very effective flocculants, particularly for the removal of biocolloids from wastewater, is produced by the reaction between a silicic acid sol and an aminofunctional aliphatic silane. The flocculative effectiveness of the silicic acid polymer molecules so modified can be explained on the basis of the stockable agrifusction, thereby both of the probable manifestation thereby both of the mechanism of attachment characteristic of silica sol and of the mechanism of attachment characteristic of cationic polyelectrolytes. (Sinha-OEIS) W74-12441

METHOD OF DISINFECTING WATER AND DEMAND BACTERICIDE FOR USE THEREIN, Kansas State Univ., Research Foundation, Manhattan.

For primary bibliographic entry see Field 5F. W74-12442

WASTE WATER TREATMENT METHOD,

Texaco, Inc., New York. J. F. Tate.

U.S. Patent No. 3,817,859, 3 p, 3 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 1067, June 18, 1974.

Descriptors: *Patents, Chemical reactions, *Liquid wastes, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Acidity, Sulfides, Alkaline earth metals, Metals, Alkaline water, Hydrogen ion concentra-

Identifiers: *Pollution prevention, Cresylates, Iron salts.

In the case where two streams of waste water are In the case where two streams of waste water are alkaline and are capable of forming a solid precipitate upon contact with each other, the pH is lowered to an acidic range to inhibit the formation of a precipitate of the dissolve any precipitate already formed. The waste in the original streams be in the category of sulfides, cresylates and soluble iron salts and alkaline earth metal ions. The acid recommended is hydrochloric acid. (Sinha-OEIS) W74-12443

AEROBIC SEWAGE TREATMENT SYSTEM, Coate Burial Vault, Inc., West Milton, Ohio. K. J. Yost.

U.S. Patent No. 3,817,858, 5 p, 8 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 1067, June 18, 1974.

Descriptors: *Patents, *Liquid wastes, *Sewage treatment, *Aerobic treatment, *Chlorination, *Waste water treatment, Water treatment, Pollution abatement, Water pollution control, Water quality control, Equipment.
Identifiers: *Water clarification.

Liquid sewage is directed generally tangentially into a large, flat and shallow aerobic settlement tank to expose a large surface area of the sewage per unit volume. Air is circulated over the surface of the sewage in a spiral direction to effect circula tion or turbulence of the sewage within the tank and diffusion of the air into the liquid. The air flow within the tank is produced by connecting the air outlet of the tank to a chimney which projects up-ward adjacent to the outer wall of the residence and creates a natural draft. The liquid treated in the aerobic settlement tank is directed into a similarly shaped aerobic digestor and clarifier tank which also provides for circulation of the treated liquid and diffusion of the air in response to a enerally spiral flow of air also created by the chimney draft. The second tank defines an annular clarifier chamber which receives the treated liquid before it is discharged. The discharged effluent may be directed through a chlorinator formed by a vertical housing which receives a supply of chlorine crystals. The crystals are urged downward into the path of the effluent by a combined weight and valve which is effective to stop the flow of treated liquid in the event additional chlorine crystals are not added to the supply. (Sinha-OEIS)

TREATMENT OF WASTEWATER.

Autotrol Corp., Milwaukee, Wis. W. N. Torpey.

U.S. Patent No. 3,817,857, 5 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 1066, June 18, 1974.

Descriptors: *Patents, *Waste water treatment, *Riological treatment. *Oxidation, *Biological treatment, *Oxidation,
*Denitrification, *Pollution abatement, Water pollution control, Water quality control, Equipment. Identifiers: *Activated slime, Nitrogenous wastes, Carbonaceous wastes

Wastewater is treated by the use of a mixture of biologically activated slimes attached to partially submerged rotating contractors, in order to ac-complish the oxidation of carbonaceous and nitrogenous matter. The contractors are mounted in a single-stage treatment unit. They are supplied with wastewater at a controlled rate relative to the surface of the contractors and are distributed

evenly over the surface of the contractors. A denitrifying unit is supplied with wastewater and recirculated effluent from the single-stage treatment unit. The denitrifying unit utilizes biologi-cally active slimes attached to rotating biological contractors for the removal of carbonaceous matter from the wastewater supported by nitrate oxygen from the recirculated effluent. (Sinha-W74-12445

APPARATUS FOR REMOVING PARTICULATE

B. Michel, and A. A. Delaney. U.S. Patent No. 3,817,383, 7 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 950, June 18, 1974.

Descriptors: *Patents, *Water treatment, *Waste water treatment, Hydraulics, Water quality control, Water pollution control, *Pollution abatement, Equipment, Separation techniques.

The device is intended to remove trash, ice particles or other suspended materials through hydrau-lically created forces. The structure is provided with a passage such that three stratum or layers of the liquid are formed. A splitting means is placed in the passageway permitting the first strata to flow out of one discharge area, the second and third through separate discharge areas. The device is either partially or totally submergible in water. The shape of the passageway generates a stream velocity which permits formation of an upper strata carrying flotable particulate matter, and a lower strata which contains and carries settable matter. The splitter separates these so that the in-termediate 'cleaned' strata are discharged to the site to be utilized. (Sinha-OEIS) W74-12447

METHOD FOR THE TREATMENT OF WATER.

Mitsui Mining and Smelting Co. Ltd., Tokyo

M. Ichiki, and K. Nakade.

U.S. Patent No. 3,816,276, 3 p, 6 ref; Official Gazette of the United States Patent Office, Vol 923, No 2, p 673, June 11, 1974.

Descriptors: *Patents, *Pollution abatement, Electrolysis, *Waste water treatment, Water pollution control, Water quality control, Metals, Oily wastes, Suspended solids, Flotation.

The method involves three processes to remove metal ions, oils or suspended solids. In the first process water is electrolyzed in an electrolytic cell with an anode of aluminum or aluminum alloy while blowing air into the water so the insoluble compounds are formed. In the second, anionic water-soluble high molecular materials are added to the water so that the compounds are converted into coagulums which float on the surface. Water remaining from the second process is electrolyzed in a second electrolytic cell provided with an insoluble anode so that all the coagulums are floated to the surface for removal. (Sinha-OEIS) W74-12448

REMOVAL OF DISSOLVED OR SUSPENDED SOLIDS IN WASTE WATER,

Swift and Co., Chicago, Ill.

H. T. Anderson.

U.S. Patent No. 3,816,274, 5 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 923, No 2, p 673, June 11, 1974.

Descriptors: *Patents. *Emulsions. *Waste water Descriptors. "atents, "mustors, waste water treatment, "Oily wastes, "Waste water treatment, Pollution abatement, Water polution control, Water quality control, Suspended solids, Flota-tion, Chemical reactions, Hydrogen ion concentra-

Identifiers: Anolyte.

Group 5D—Waste Treatment Processes

Greasy matter is separated by conveying an emulsified water fat solution to a first zone of a container where the walls act as a cathode. Anodes are Placed transverse to the entry flow of the solution. The pH changes at least 2 units conveying the solution to a second zone having anodes positioned so that the lowest potential is greater than 0.6 volts but not more than 3 volts and impressing electrical current throught the solution forming a three dimensional anolyte body of solution. The fat particles separate from the water and float to the surface for removal. (Sinha-OEIS)

ARRANGEMENT FOR CONTINUOUS TREAT-MENT OF POLLUTED LIQUIDS.

Ceskoslovenska Akademie Ved, Prague.

,Mackrle, and V. Mackrle.

U.S. Patent No. 3,815,750, 7 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 923, No 2, p 550, June 11, 1974.

Descriptors: *Patents, *Flocculation, water treatment, Pollution abatement, Water pollution control, Water quality control, Equipment, Sludges, Sedimentation, Filtration. Identifiers: *Bioflocculation.

An arrangement for the continuous treatment of polluted liquids by a bioflocculation process com-prises a bioflocculation space and a chamber having a perfectly fluidized sludge blanket situated above the bioflocculation space. The bioflocculation space is enclosed in at least two connected vessels of cylindrical shape having outer mantles with a horizontal axis, aligned side by side, the bottom of the chamber having the perfectly fluidized sludge blanket being formed at least partly by the mantles of the bioflocculation vessels. Means for supplying oxydation gas into the bioflocculation space and means for promoting a helical and circulating motion in the vessels forming the bioflocculation space are provided. Polluted liquid is converted to a suspension. A sedimentation channel is inclined with respect to a vertical line and the adjacent bioflocculation space. (Sinha-OEIS) W74-12452

TREATMENT OF SEWAGE OR CON-TAMINATED WATER.

Albright and Wilson Ltd., Oldbury, (England). D. A. Swales.

U.S. Patent No. 3,814,686, 3 p, 4 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 923, No 1, p 264, June 4, 1974.

Descriptors: *Patents, *Sewage treatment, *Coagulation, *Industrial wastes, *Waste water treatment, *Water pollution treatment, Iron, Aluminum, Magnesium, Chromium, precipitation, Treatment. Identifiers: Chrome residue, Metal salts. Chemical

A method is disclosed for removing suspended solids from contaminated water by adding a coagulant. The coagulant is prepared by digesting chrome residue containing 35-40% by weight of Fe203, 27-32% A1203, 13-18% MgO, and 12-17% Cr203 with a strong mineral acid selected from the group consisting of 20-36% by weight hydrochloric acid and 20-100% by weight sulphuric acid to form a solution of metal salts, the solution containing trivalent iron, aluminum, and chromium ions, and magnesium ions. (Sinha-OEIS) W74-12454

AERATION APPARATUS,

Envirotech Corp., Salt Lake City, Utah. D. Di Gregorio, and G. L. Shell. U.S. Patent No. 3,814,396, 4 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 923, No 1, p 193, June 4, 1974. Descriptors: *Patents, *Waste water treatment, *Aeration, Pollution abatement, Water pollution control, Water quality control, Bubbles, Equip-

The apparatus comprises a non-impelling bubble shearing mechanism secured to and rotatable with the submerged end of a vertical shaft. An axial flow impeller is fixed to the shaft above the shearing mechanism to rotate with it. The impeller drives liquid downward past the shearing mechanism to intersect and entrain the sheared bubbles. This provides increased retention of the mixture in the lower portion of the liquid, and additional contact between sheared bubbles and recirculating liquid before the bubbles rise to the liquid surface. The shearing mechanism includes a hollow cylinder having an open bottom to receive bubbles, a closed top concentrically secured to a rotating shaft, and a slotted sidewall through which the bubbles are released and sheared. (Sinha-OEIS) W74-12456

REVERSE OSMOSIS FOR MUNICIPAL WATER SUPPLY, Du Pont de Nemours (E.I.) and Co., Inc., Wilming-

ton, Del. C. P. Shields.

Water and Sewage Works, Vol 119, No 1, p 64-70, January, 1972. 7 fig, 2 tab.

Descriptors: *Reverse osmosis, *Municipal water, *Desalination processes, *Water treatment, Ions, Water quality, Waste water treatment, *Water

Reverse osmosis is the newest water treatment process in a decade and provides an important tool for improving water quality and utilizing previously untapped sources of water. The principal applications for reverse osmosis are in the desalting of brackish water having total dissolved solids between 1,000 and 15,000 mg/l. Minerals removed include Fe, Ca, Mg, Na, K, bicarbonate, chloride, sulfate and fluoride. RO is a membrane process that acts as a molecular filter to remove up to 90-95 percent of all dissolved organics, and 98+ percent of biological and colloidal matter. The most important capability for municipal water treatment is reduction of the excess dissolved solids. Reverse osmosis costs have now reached the point where desalting is justified for communities currently using poor quality water and is competitive with conventional means of acquiring additional supply. (Jernigan-Vanderbilt) W74-12513

FILTRATION OF OILFIELD PRODUCED WATERS.

J. T. Wallace. Society of Petroleum Engineers of AIME Preprint SPE 4251, 1972. 6 p, 7 fig.

Descriptors: *Filtration, *Waste water treatment Water purification, Water quality control, *Well filters, Water pollution, *Groundwater, Oil wastes, Oily water, Brine disposal, *California. Identifiers: *Long Beach(Calif), Contamination, *Permanent media pressure filters, Automatic backwash system.

The city of Long Beach, California was recently awarded first prize in a national environmental competition for pioneering a program of getting the various field operators to build filtration systems to handle produced oil field brinewater, and then to reinject the filtered wastewater back underground, serving the dual purpose of eliminat-ing a potential pollution problem and helping to curb subsidence. The produced water may contain as much as 25 to 50 parts per million of oily residue and an equal quantity of suspended solids, but it is also oxygen deficient. The oily residue and solids have little effect on marine life, but the oxygen deficiency would be detrimental. The application

of deep bed dual media filters as the final step before injection made the program economically feasible by removing the majority of the contaminants and making injection into the aquifers a reality. (Campbell-NWWA) W74-12539

NITRIFICATION AND DENITRIFICATION FACILITIES. WASTEWATER TREATMENT, Metcalf and Eddy, Inc., Boston, Mass. C. N. Sawyer, H. E. Wild, Jr., and T. C.

Environmental Protection Agency Technology Transfer Seminar Publication, August 1973. 33 p, 24 fig, 3 tab, 13 ref.

Descriptors: *Nitrification, *Denitrification, *Treatment facilties, *Sewage treatment, Biochemical oxygen demand, Nitrates, Nitrogen, Ammonia, Hydrogen ion concentration, Temperature, Kinetics, Design, Settling basins, Sludge, Effluents, Pilot plants. Identifiers: Nitrogenous oxidation.

Wastewater treatment plants designed to accom-plish nitrification and denitrification require a three-stage biological system in climates where wastewater temperatures drop below 18C. The first stage is necessary to remove carbonaceous BOD-5 to levels of about 50 mg/l. The second stage is needed to accomplish nitrification and should be designed to employ the plug-flow princi-ple as closely as possible. The third stage accomolishes denitrification. A source of carbonaceous BOD must be added to reduce the nitrates to nitrogen gas in a reasonable period of time. Studies showed that factors affecting nitrification kinetics are: the ammonia-nitrogen concentration did not inhibit nitrification in concentrations of less than 60 mg/l; pH did not affect the rate of nitrification (optimum 8.4); temperature did not affect the nitrification (rate increased through the range of 5 degrees to 30C); the time required for nitrification is directly proportional to the amount of nitrifiers in the system; instantaneous increases (from 50 to 110 mg/l) or decreases (from 50 to 5 mg/l) in BOD concentration did not affect the rate of nitrifica-Design criteria and denitrification by suspended growth systems, are described both based on pilot plant data. (Jones-Wisconsin)

SIMULATION OF THE DIFFUSION OF DIS-SOLVED SALTS IN AQUIFERS,

California Univ., Los Angeles. School of Engineering and Applied Science. For primary bibliographic entry see Field 5B. W74-12594

EVALUATION OF CONCEPTS FOR SEPARATING OIL FROM WATER DISCHARGED FROM

SHIPS,
Coast Guard, Washington, D.C. Office of
Research and Development. For primary bibliographic entry see Field 5G. W74-12642

PHOTOSYNTHETIC RECLAMATION AGRICULTURAL SOLID AND LI LIQUID

WASTES, California Univ., Berkeley. Sanitary Engineering Research Lab.

C. G. Golueke, W. J. Oswald, G. L. Dugan, C. E. Rixford, and S. Scher.

Available from NTIS, Springfield, Va. 22161 as PB-222 454, Price \$3.75 printed copy, \$2.25 microfiche. Environmental Protection Agency, Ecological Research Series Report EPA-R3-73 031, August 1973. 83 p, 10 fig, 7 tab, 26 ref. EPA Grant No EP-00272.

Descriptors: *Waste disposal, *Farm wastes, *Domestic wastes, *Recycling, *Algae, Water reuse, *Anaerobic digestion, *Waste water treat-

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ment, Nutrients, Fermentation, Photosynthesis, Solid wastes, Liquid wastes, Pilot plants, Kinetics. Identifiers: Anaerobic treatment.

A system with which a large fraction of the wastes produced by agricultural industries could be converted into a useful material without imposing an unacceptable burden on the environment was stu-died. Specifically, the project involved a detailed study of the basic characteristics of an integrated anaerobic fermentation and algae growth system for agricultural solid and liquid wastes on a laboratory and small pilot plant scale, with special atten-tion devoted to the reaction kinetics of the system. A substantial degree of nutrient recovery and recycle can also be attained in the system. (Knapp-USGS) W74-12647

SURVEY OF METHODS OF TREATING WINE AND GRAPE WASTEWATERS,

New York State Dept. of Environmental Conservation, Albany. T. J. Tofflemire

Am J Enol Vitic. Vol 23, No 4, p 165-172, 1972.

Descriptors: *Industrial wastes, *Waste water treatment, Effluents, *Biological treatment. Identifiers: Grapes, *Wine.

The waste characteristics and treatment methods for wine and grape wastewaters are discussed. The wastewater is strong and highly variable, and tends to become odorous upon standing. Stillage represents a more concentrated and acidic waste water that may require neutralization. The P and N content of the wastewater is less than ideal by the 1/30/150 standard. The treatment methods discussed include activated sludge systems, aerated lagoons, trickling filters, rotating biological discs, irrigation systems, anaerobic processes, and chemical processes.—Copyright 1973, Biological Abstracts, Inc. W74-12676

EXPERIENCE IN SANITARY EVALUATION OF THE USE OF POLYETHYLENE PIPES FOR RURAL WATER SUPPLY LINES, (IN RUS-SIAN).

Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR). V. O. Sheftel, and V. G. Sinitskii. Gig Sanit. Vol 38, No 3, p 111-113. 1973.

Descriptors: *Water quality, *Effects, Pipelines, Pipes, *Plastic pipes, Plastics.

Under laboratory conditions, low density polyethylene stabilized by C did not have a significant effect on the organoleptic, physicochemical and microbiological indices of water quality. Over 300 analyses of water from 8 water supply lines were carried out over an 8 yr period .-- Copyright 1974, Biological Abstracts, Inc W74-12716

BIOLOGICAL TREATMENT OF PHOTO PROCESSING EFFLUENTS, Eastman Kodak Co., Rochester, N.Y.

J Water Pollut Control Fed. Vol 45, No 10, p 2123-2135, 2239, 1973, Illus.

Descriptors: Wastes. *Industrial wastes. *Chemical wastes, *Discharge(Water),
*Effluents, Activated sludge, *Aeration, *Waste
water treatment, *Biological treatment. Identifiers: *Photographic processing wastes

Photographic processing effluents can be handled effectively by municipal collection and treatment systems. Domestic wastes with up to 20% photographic waste cause no adverse effects on the ac-tivated sludge system. Where no municipal facili-ties are available to a processor, the wastes can be treated in an extended aeration packaged unit. Up to 85% reduction in biochemical oxygen demand (BOD) can be obtained with such units.--Copyright 1974, Biological Abstracts, Inc.

SOIL MICROORGANISM METABOLISM IN

SPRAY IRRIGATION,
North Texas State Univ., Denton.
G. R. Vela, and E. R. Eubanks.

Water Pollut Control Fed. Vol 45, No 8, p 1789-1794, 1973, Illus.

Descriptors: Industrial wastes, *Waste water treatment, Effluents, Canneries, Irrigation systems, Bacteria, Soil bacteria, Metabolism. Identifiers: *Spray irrigation treatment.

A study of the microbial activities in a spray irrigation treatment system for cannery wastewater showed that there was no enzymatic activity in the process water and that bacteria in the effluent contributed little or nothing to purification. Specific bacterial populations developed in the spray fields. These bacteria hydrolyzed polymers and oxidized monomers in the wastewater. Only 16 of 100 isolated species contributed directly to purification, although the remainder probably contributed indirectly. There was no correlation between total numbers of bacteria and oxidative capacity of the soils in the irrigation field.--Copyright 1974, Biological Abstracts, Inc. W74-12725

TREATMENT OF OILY WASTES FROM A STEEL MILL,

McMaster Univ., Hamilton (Ontario). D. R. Woods, and M. W. Slezak.

J Water Pollut Control Fed. Vol 45, No 10, p 2136-2145, 2239, 1973. Illus.

Descriptors: *Waste treatment, Distillation, Mixing, *Oil wastes, *Coagulation, *Solvent extraction, Wastes.

The theory of stability of an oily waste is reviewed. Two laboratory-scale processes are described to treat the waste. In the solvent extraction process, a small amount of electrolyte added to the oily waste feeds to a countercurrent mixersettler solvent-extraction column. With water phase continuous and at a relatively high rpm for the mixing, good quality effluent could be obtained in 6 stages. The solvent could be recycled. Bench-scale operating conditions were identified. In the coagulation process, suitable coagulants were identified from jar tests. The dosage rates, pH, and oil removal rates found in the batch iar test agreed reasonably well with the results from a carefully scaled-down flow unit.--Copyright 1974, Biological Abstracts, Inc.

5E. Ultimate Disposal Of Wastes

HIGH-RATE LAND TREATMENT II: WATER QUALITY AND ECONOMIC ASPECTS OF THE FLUSHING MEADOWS PROJECT,

Agricultural Research Service, Phoenix, Ariz. For primary bibliographic entry see Field 5D. W74-12005

DIRECTORY OF MANAGERS, ENGINEERS AND SCIENTISTS IN OCEAN WASTE DISPOSAL AND RELATED ENVIRONMENTAL SCIENCE FIELDS,

Interstate Electronics Corp., Anaheim, Calif. Oceanics Div.

C. T. Tucker, and R. J. Marmolejo. Available from NTIS, Springfield, Va. 22161 as PB-224 459, Price \$3.50 printed copy; \$2.25 microfiche. Contract Report 4460C1543 for Environmental Protection Agency, June 1973. 67 p. EPA Contract 68-01-0796.

Descriptors: *Waste disposal, *Water pollution control, *Personnel, Professional personnel, Scientific personnel, Management. Identifiers: *Directories.

This directory of managers, engineers, scientists working in ocean waste disposal is intended to facilitate communiction in the field of ocean waste disposal and related environmental sciences. (Knapp-USGS) W74-12020

STORAGE OF PLUTONIUM METAL IN SEALED CANS.

Dow Chemical Co., Golden, Colo. Rocky Flats

For primary bibliographic entry see Field 5D. W74-12046

SOME EXTENSION SERVICE CAPABILITIES.

Georgia Univ., Athens. Cooperative Extension For primary bibliographic entry see Field 6E. W74-12172

BRINE DISPOSAL TREATMENT PRACTICES RELATING TO THE OIL PRODUCTION IN-

DUSTRY,
Oklahoma Univ. Research Inst., Norman. School of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 5D. W74-12211

WASTE OIL RECYCLING AND DISPOSAL, Recon Systems, Inc., Princeton, N.J.

For primary bibliographic entry see Field 5D. W74-12215

ACTIVE PROJECTS, PURE WATERS RESEARCH.

New York State Dept. of Environmental Conservation, Albany. For primary bibliographic entry see Field 10C. W74-12234

PHOSPHATE REMOVAL BY SANDS AND

New York State Dept. of Environmental Conservation, Albany.

Vation, Albany.

T. J. Tofflemire, M. Chen, F. E. Van Alstyne, L. J. Hetling, and D. B. Aulenbach.

December 1973. 72 p, 17 fig, 5 tab, 243 ref.

*Phosphorus Descriptors: compounds. Descriptors: "Phosphorus compounds, "Phosphorus, "Soil chemical properties, "Soil physical properties, "Waste water disposal, "Pollutants, Soil chemistry, Soil investigations, Pollution abatement, Waste water treatment, Soil surveys, Soil testing.

Identifiers: *Phosphorus removal, *Phosphorus disposal.

An approach is presented for evaluating a land disposal site for phosphorus removed from waste-water. It involves: (1) making a field reconnaissance, (2) gathering literature data on soils, and geology; (3) determining the flow pathway of the wastewater; (4) taking soil samples in that pathway; (5) analyzing the soil samples for particle size distribution, pH and rapid phosphate adsorp-tion capacity; and (6) calculating and adding the capacities of the various soil volumes involved. The land disposal system is then designed so that it does not exceed the phosphate adsorption capacity of the site for the time desired. Further studies should be conducted on long term phosphate mineralization or the site should be rejected as unacceptable. Because the necessary field data is difficult to gather, the approach involves a number

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of assumptions and will yield a conservative estiof assumptions and will yield a conservative expension mate of the phosphorus removal. For very large treatment systems, column studies, field pilot studies and ground water modeling studies are also recommended. At an operating land disposal site, wells and lysimeters can be installed to measure resulting ground water quality. (Poertner) W74-12235

THE TREATMENT AND REMOVAL OF WASTE WATER RESIDUAL SLUDGES IN THE PAPER INDUSTRY (DIE BEHANDLUNG UND BESEITIGUNG VON RESTABWAS-BESEITIGUNG VON RESTABWAS-SERSCHLAEMMEN DER PAPIERINDUSTRIE), Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany).

G. Strittmatter.
In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 407-418,

Descriptors: *Sludge, *Pulp wastes, *Dewatering, *Sludge treatment, *Waste disposal, *Ultimate disposal, *Separation techniques, *Recycling, *Solid wastes, Incineration, Landfills, Filtration, Centrifugation, Effluents, Research and development. Marketing.

The separation, thickening (concentration), de-watering (by centrifugation or filtration), reuse. and disposal (by combustion, landfill, etc.) of paper mill effluent sludges are discussed. Although separation and sludge treatment problems are largely solved, the recirculation of white water sedimentation sludge into commercial marketable products, such as flameproof building panels, will require much more research and development work. (See also W74-12400) (Brown-W74-12417

FILTRATION OF OILFIELD PRODUCED WATERS,

For primary bibliographic entry see Field 5D. W74-12539

HYDROLOGY OF RADIOACTIVE-WASTE DISPOSAL AT THE IDAHO CHEMICAL PROCESSING PLANT, NATIONAL REACTOR TESTING STATION, IDAHO, P. H. Jones.

Geological Survey Research, Article 420, 1961. p D-374-D-376, 2 fig, 1 tab, 1 ref.

Descriptors: *Radiation, *Groundwater, Reservoirs, Basalts, Silts, Gravel, Sand, Brine, Aquifers, Petrology, Hydrology, Water wells, Adulters, Petrology, Hydrology, Mater Wals, Boreholes, Gamma rays, Waste water(Pollution), Salinity, Water quality, Waste disposal, *Idaho. Identifiers: National Reservoir Testing Sta-tion(Ida), *Radioactive-waste disposal, *Intercept wells, Vertical flow

Low-level aqueous radioactive waste (less than 10 to the minus 4 microcuries per milliliter, gross beta-gamma) is pumped directly into the ground-water reservoir at the Idaho Chemical Processing Plant (ICPP) through a drilled, cased, gravel-packed well 598 feet deep. This well penetrates several thin basalt flows and a single thin bed of silt, sand, and gravel below the water table, which occurs at a depth of about 460 feet. Radioactive waste is diluted with warm nonradioactive water from plant wastes, including large amounts of sodium-chloride brine from water-softening units. Since 1952, 757 curies of activity have been disposed to this well in 2 1/2 billion gallons of water. Vertical flow between aquifers tapped by intercept wells results in an erratic distribution of waste water in the ground-water reservoir and makes measurements of water level in the well useless for quantitative purposes. Effective study of vertical flow requires reconstruction of intercept wells so that they tap but one aquifer. Where this has been done using modified oilwell packers, head differences between aquifers generally occur in waters from different aquifers tapped by the same well. (Campbell-NWWA) W74-12546

DISPOSAL OF URANIUM-MILL EFFLUENT NEAR GRANTS, NEW MEXICO,

S. W. West. Geological Survey Research, Article 421, 1961. p D-376-D-378, 2 fig, 1 tab.

Descriptors: Effluents, Potable water, Aquifers, *Groundwater, Limestones, Mills, Stratigraphy, Alluvium, Basalts, Disposal, Sandstones, Bedding, Injection wells, Faults(Geologic), Fractures, Pressure, *New Mexico

Identifiers: *Uranium-mill effluents, San Andres limestone, Glorieta sandstone, Evaporation pond.

Disposal of uranium-mill effluent at the Anaconda Co. Bluewater Mill, 9 miles northwest of Grants, N. Mex., became a problem in a relatively short time after the mill was built in 1952. The use of an evaporation pond in a natural depression and much research by The Anaconda Co. on impervious pond linings and on other methods of surface disposal indicated that surface methods of disposal might contaminate the potable ground water. The company then investigated the possi-bility of injecting the waste fluids into an unused aquifer that contains non-potable water and is below, and isolated from, the principal sources of ground water in the area. There are many faults in the region, and it was feared that fractures in the fault zones might be conduits through which water could move from one formation to another. It seemed possible, also, that permeable beds might be offset against impermeable beds forming barriers to lateral movement of water away from the injection well and causing excessive buildup of hydraulic pressure in the disposal zone. The initial injection test indicated that vertical leakage was negligible and that one or more faults are barriers to lateral movement of the water. Temporary cessation of injection at critical times during the test period obscured the reaction of the water level to the probable barrier. Thus, the future pressure buildup cannot be forecast until more is learned about the effects of the barrier. (Campbell-NWWA) W74-12552

5F. Water Treatment and **Quality Alteration**

STUDY RELATING TO THE USE OF A PROCESS CONTROL COMPUTER FOR A WATER TREATMENT PLANT IN FRANCE, Compagnie Generale des Eaux, Paris (France)

D. Coyaud. In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 229-239, 25-27 September 1973. 3 ref.

Descriptors: *Industrial plants, *Management, Computers, Control, *Water treatment, Computers, Control, *Water treatment, *Treatment facilities, Water quality, Data processing, Investment, Pumping, Ozone, Monitoring, Operating costs, Europe, Statistics. Identifiers: *Process control, *France, Filter washing, Caustic soda, Raw water, Savings.

The management of modern industrial plants presents many intricate problems difficult to solve. Therefore, computers operating in real time are being used to assist the technical management. The Compagnie Generale des Eaux proposes to install a process control computer in its plant at Neuilly-sur-Marne. The computer will control the pumping and treatment equipment existing on site, and as a second stage it will be extended to structures and networks outside the plant. Discussed are the functions to be initially ensured: (1) super-

vision of about 160 measurements, 360 status conditions and 230 alarm conditions; (2) data processing yielding information easily usable by in charge of plant; (3) issue of reports and statistics; (4) optimized control of sub-assemblies (i.e., pumping program, equal distribution of the flow, best conditions for filter washing, etc); and (5) management of chemical stocks through off-(5) management of chemical stocks through off-line programs, together with group maintenance schedule, statistics and data analysis. The initial investment and the running costs have been estimated, as well as expected savings. Installations using computers in Europe (Chambrey, France, St. Gall, Switzerland, and Luxemburg dam) are given as examples. (See also W74-12107) (Bell-Grand) W74-12119

COMPUTER USE IN US WATER AUTHORITY, Chicago Dept. of Water and Sewers, Ill.

I. B. Corey In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Con-ference, University of Reading, England, p 241-249, 25-17 September 1973. 2 fig. 1 append.

Descriptors: *Water works, Computers, *Control, Descriptors: "water works, Computers, "Control, Regions, Management, Operation and maintenance, Monitoring, "Water treatment, Treatment facilities, Water quality, Water quantity, Water utilization, Lake Michigan.

Identifiers: "Chicago(III), "Process control,

*Filtration plants, Reporting, Physical set-up.

The City of Chicago waterworks system is outlined and the extent to which process computer capability is utilized is considered in more detail. The physical set-up is described together with the monitoring and reporting functions of the system. All computer capability is at present located in the Central Water Filtration Plant, the world's largest water treatment plant; an Appendix is included which briefly describes this installation. A typical flow disease is acknown. In conditions we water the condition of the plant is not provided to the provided the plant in the provided the pro flow diagram is shown. In conclusion, possible fu-ture developments are indicated. (See also W74-12107) (Bell-Cornell)

THE START-UP MODEL OF A RAPID SAND

FILTER, Philips Forschungslaboratorium G.m.b.H., Ham-burg (West Germany). M. Klinck.

In: Computer Uses in Water Systems: Contributed In: Computer Oses in water Systems. Controlled Papers. A Water Research Association Con-ference, University of Reading, England. p 101-104, 25-27 September 1973. 2 fig, 3 equ, 1 ref.

Descriptors: *Water treatment, *Water quality control, *Treatment facilities, *Filters, *Simulation analysis, Effluents, Operation and maintenance, Design, Pipe flow, Control, Model studies, Computers, Systems analysis.

Identifiers: Rapid sand filters, Start-up model, Washing procedure.

Rapid sand filters play a very important role in many water treatment plants. An operation model can be built as the basis for the design of the corresponding level control loop. With this operation model, which describes the static and dynamic behavior, the structure of the level controller can behavior, the structure of the level controller can be designed and the parameters can be chosen. During the startup period after a washing procedure, however, the operation model for the rapid sand filters is not valid. Using simulation analysis, a start-up model is derived and the start-up behavior of the level-controlled rapid sand filter is investigated. Use of a simulation language for continuous systems upning an adjust leaves. for continuous systems running on a digital com-puter is advantageous in such investigation. Much puter is advantageous in such investigation. Much money can be saved during the installation and test period of a plant, if use is made of simulation-aided design methods for the control of complete water treatment plants. (See also W74-12107) (Bell-Cornell)
W74-12146

Water Quality Control—Group 5G

METHOD OF DISINFECTING WATER AND DEMAND BACTERICIDE FOR USE THEREIN, Kansas State Univ., Research Foundation, Manhattan

J. L. Lambert, and L. R. Fina.

U.S. Patent No. 3,817,860, 6 p, 3 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 1067, June 18, 1974.

Descriptors: *Patents, *Water purification, *Water treatment, *Disinfection, *Bactericides, Halogens, Iodine, Iodides, Microorganisms, Bacteria, Resins, Anion exchange, Waste water treatment.
Identifiers: *Chemical treatment, Triiodide resins.

A method of treating bacterially contaminated water for direct production of disinfected water ready for use is disclosed. The water is rendered bacterially sterile by passing it through a strongly basic anion exchange resin containing combined triiodide without forming a detectable concentra-tion of iodine in the disinfected water. The triiodide is combined in a stable form with the basic groups of the resin. Although the dissocia-tion of the iodine of the resin-insolubilized triiodide is extremely low, the triiodide resins are highly bactericidal, the triiodide groups reacting on demand with bacteria in water suspensions to kill the bacteria. (Sinha-OEIS) W74-12442

APPARATUS FOR REMOVING PARTICULATE

For primary bibliographic entry see Field 5D.

BIOLOGICAL TREATMENT OF PHOTO PROCESSING EFFLUENTS,

Eastman Kodak Co., Rochester, N.Y. For primary bibliographic entry see Field 5D. W74-12718

EPIDEMIOLOGICAL ASPECTS OF THE PROBLEM OF SANITARY PROTECTION OF BODIES OF WATER, (IN RUSSIAN), For primary bibliographic entry see Field 5G.

5G. Water Quality Control

RPC DIVISION, MIDLAND-ROSS CORP. 10-GALLON-PER-MINUTE LIQUID/LIQUID LIQUID/LIQUID

Army Mobility Equipment Research and Develop-ment Center, Fort Belvoir, Va. Fuels Handling Equipment Div. E. C. Russell.

Available from NTIS, Springfield, Va. 22161 as AD-763 154. Price \$3.00 printed copy; \$2.25 microfiche. Report 2058, May 1973. 11 p, 2 fig, 3 tab. MIPR-Z-70099-1-13218.

Descriptors: *Separation techniques, *Oily water, *Ships, *Water pollution control, Waste water treatment, Equipment, Evaluation, Water pollution treatment.

A 10-gpm liquid/liquid separator was tested to determine its suitability as a shipboard oil pollution control device. The separator is more effective with coalescer elements installed in all three stages. Redesign of the vessel may be required, however, to enhance complete separation and removal of coalesced oil at high oil injection rates. The high pressure drop across the test unit at the increased flow rate and the test unit weight-to-capacity ratio are excessive. The separator is a two-stage (later converted to three stages by the manufacturer) coalescence-type device. (Knapp-USGS) W74-12009

DIRECTORY OF MANAGERS, ENGINEERS AND SCIENTISTS IN OCEAN WASTE DISPOSAL AND RELATED ENVIRONMENTAL SCIENCE FIELDS,

Interstate Electronics Corp., Anaheim, Calif. Oceanics Div.

For primary bibliographic entry see Field 5E. W74-12020

LEAK DETECTION IN UNDERWATER OIL

National Maritime Research Center, Galveston, Tex. Cargo Handling and Terminals Program. For primary bibliographic entry see Field 5A. W74-12065

BAILEY OIL CONTENT MONITOR, Esso Research and Engineering Co., Floram Park,

For primary bibliographic entry see Field 5A.

EFFLUENT MANAGEMENT INFORMATION SYSTEM (EMIS), Development Sciences, Inc., East Sandwich,

M. Gorden, and M. Gorden. Available from NTIS, Springfield, Va 22161 as PB-221 890 Price \$5.45 printed copy; \$2.25 microfiche. Contract Report, July 1972. 127 p. NSF Grant C-673.

Descriptors: *Information exchange, *Pollution abatement, *Planning, Data collections, Publica-tions, Ecology, Information retrieval, Data storage and retrieval, Systems analysis. Identifiers: *Information systems.

The Effluent Management Information System deals with generating new alternatives to pollution abatement, disseminating known techniques, and providing a systematic framework for evaluating the quantitative potential of industrial response to government policy. It identifies alternatives through a materials flow analysis which links firms to find compatible solutions to pollution control. Incorporating economic criteria of increasing productivity from efficient waste management, and applying ecological criteria, the Effluent Management Information System identifies firms within and among 8-industries which could benefit from resource recovery, shared capital investment in treatment centers, and land assimilable waste. A man-machine combination adds known solutions and new alternatives to facilitate dissemination of choices to government policymakers and industry. The system can also indicate in what specific regions a range of solutions is possible, thus giving planners insight into present possible responses and future planning alternatives. The system is also linked to a land use planning tool for siting of new industry. Through the application of these management tools, the conflict between economic growth and environmental quality can be minimized. (Knapp-USGS) W74-12082

WATER QUALITY CONSIDERATION FOR THE METAL MINING INDUSTRY IN THE PACIFIC NORTHWEST,

Environmental Protection Agency, Seattle, Wash.

Available from NTIS, Springfield, Va 22161 as PB-226 995 Price \$7.75 printed copy; \$2.25 microfiche. Environmental Protection Agency Report No Region X-3, 1973. 89 p, 1 fig, 4 tab, 12 ref,

Descriptors: *Mining, *Mine wastes, *Water pollution control, Mine acids, Mine water, Acid mine water, Spoil banks, Waste dumps, Water pollution sources, Legislation, Water law, *Water quality standards. The principal causes of water pollution at both active and abandoned mines are discussed. Recom mendations are given for minimizing the effects of mining on water quality. The 1972 Federal Water mining on water quanty. The 1972 Federal water Pollution Control Act contains many provisions that relate directly with mining operations. It establishes a national goal of eliminating the discharge of pollutants into the waters of the United States by 1985. Interim goals call for the application of best practicable control technology by 1977 and the best available technology by 1983. The FWPCA also requires the states to establish water quality standards for all surface waters. These standards describe water quality conditions that are acceptable to the states and Federal government. The standards for turbidity, suspended solids and heavy metals will have a direct effect on mining operations. (Knapp-USGS)

REAERATION IN OPEN-CHANNEL FLOW,

Canada Centre for Inland Waters, Burlington (Ontario) Y. L. Lau.

Y. L. Lau.
In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference,
Alberta University, Edmonton, May 10-11, 1973.
Alberta University Water Resources Center Publication No 4, p 257-272, 1973. 3 fig, 1 tab, 13 ref.

Descriptors: *Reaeration, *Oxygenation, Self-purification, Water quality, Reviews, Dimensional analysis, Regression analysis, *Open channel

Theoretical models of the mechanism of oxygen absorption are reviewed; they are deficient as far as prediction of the reaeration rate is concerned. Empirical prediction equations resulting from regression analysis of laboratory or field data are applicable over only small ranges of flow conditions. The governing parameters in the process of reaeration in open-channel flow were identified through use of dimensional analysis. The discrepancy which has been suggested to exist between some sets of flume data was actually the result of the method of analysis. A new prediction equation is proposed. (See also W74-12087) (Knapp-USGS) W74-12099

CONTROL OF SEA WATER INTRUSION BY SALTWATER PUMPING--A MATHEMATICAL MODEL, MacLaren (James F.) Willowdale (Ontario).

A. F. Ashamalla, and P. L. Hall.

In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 337-354, 1973. 4 fig, 9 ref.

Descriptors: *Saline water intrusion, *Drawdown, *Aquifers, *Groundwater movement, Pumping, *Mathematical models, *Canada, Withdrawal, Simulation analysis, Saline water barriers. Identifiers: *Shippegan(NB-Canada).

A mathematical model was built to simulate the effect of pumping on saltwater intrusion in coastal aquifers. The model calculates the motion of a shallow interface in either a phreatic or confined aquifer of varying thickness and properties. Any pattern of recharge by natural replenishment or discharge by pumping at different locations can be simulated. An implicit scheme is used for the solution of the partial differential equations, with changeable size and time increment. The model was used for the solution of an intrusion problem at Shippegan, New Brunswick. The movement of the saltwater wedge along various profiles was computed in response to freshwater pumping. In order to control the intrusion, a saltwater well was located in the model at different locations, and the movement of the saltwater wedge was predicted for different pumping rates. The best locations and pumping rates for the saltwater wells were found

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for the prevailing natural boundary conditions and the required water demand. (See also W74-12087) (Knapp-USGS) W74-12102

COMPUTER USES IN WATER SYSTEMS: CON-FERENCE REPORT.

Water Research Association, Marlow (England). For primary bibliographic entry see Field 6A. W74-12107

STORET-THE EPA WATER QUALITY DATA

Environmental Protection Agency, Washington.

For primary bibliographic entry see Field 6A. W74-12108

COMPUTER SERVICES AND APPLICATION IN THE GREATER LONDON COUNCIL'S DE-PARTMENT OF PUBLIC HEALTH ENGINEER-

Greater London Council (England). Dept. of

Public Health Engineering.

A. R. Bovington, and E. L. Patient.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 10-19, 25-27 September 1973. 1 fig.

Descriptors: Computers, *Water resources, *Public health, Engineering, *Computer programs, Rivers, *Water pollution control, Flood control, Treatment facilities, Sewers, Management, Operations, Economics, Public utilities. *Centralized *London(Eng-UK).

The computing facilities used by the GLC's Department of Public Health Engineering, more than half of which will be involved in water reorganizztion, are described. Discussed are: the main instal-lation, which is the responsibility of the Computer Branch of the Treasurer's Department; other installations, operating specialized computing equip-ment: Bureau facilities: and software support. Some of the major computer applications and proposed developments are described. Considered are: centralized management applications, including, among others, an accounting scheme, a trade effluents scheme, and a sophisticated stock con-trol scheme; and technical applications, including river surface profile analysis, a sewer model, analysis of data logger output, simulation of refuse transfer stations, and analysis of treatment works operating data. Some proposed developments are a complete personnel information and retrieval system and a data base for sewer operation and management. The paper concludes with a discussion of the effectiveness of centralized computing in a large authority. (See also W74-12107) (Bell-Cornell) W74-12129

FISH NUTRITION IN THE COOLER RESER-VOIR OF THE LITHUANIAN ELECTRIC POWER STATION, (IN RUSSIAN), Akademiya Nauk Litovskoi SSR, Vilnius. Institut

Zoologii i Parazitologii. L. A. Rachunas.

Gidrobiol Zh. Vol 9, No 5, p 21-27, Illus, 1973. English summary. Identifiers: Electric powerplants, *Fish growth,

*Heated water, Nutrition, Reservoirs, *Sewage, *USSR(Lithuania), Growth rate.

Heated water sewage has no harmful effects on the fodder base of fishes. It contributes to nutritional reserves formation in the winter period, providing fishes with food in other seasons. Some differences are found in food organism composition between heated and unheated zones. In the heated zone fishes feed actively all the year round, they show comparatively high growth rate and are characterized by fatness .-- Copyright 1974, Biological Abstracts, Inc. W74-12164

BIOLOGICAL METHODS FOR THE ASSESS-MENT OF WATER QUALITY (SYMPOSIUM PRESENTED AT THE 75TH ANNUAL MEET-ING, AMERICAN SOCIETY FOR TESTING AND MATERIALS, LOS ANGELES, CALIF., 26-29 JUNE 1972).

American Society for Testing and Materials, Philadelphia, Pa.
For primary bibliographic entry see Field 5A.

W74-12174

INTERACTION OF ENGINEERS AND BIOLO-GISTS IN WATER QUALITY MANAGEMENT, Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering W. W. Eckenfelder, Jr.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., Special Technical Publication 528, p 3-5.

*Coordination. Descriptors: Education. *Engineering education, Biology, *Scientific personnel, *Water quality, *Water management(Applied), Aquatic life, Professional person-

The need for closer interaction between biologists and engineers in order to meet requirements for preservation of aquatic environments is discussed and illustrated, including a review of interdisciplinary academic programs and use of the technical literature. (See also W74-12174) (Brown-IPC) W74-12175

MIXING ZONE CONCEPTS,

National Academy of Sciences, Washington, D.C. Environmental Studies Board. C. M. Fetterolf, Jr.

In: Biological Methods for the Assessment of Water Quality, 1973, Philadelphia, Pa., ASTM Special Technical Publication 528, p 31-45. 3 tab, 7

Descriptors: Aquatic life, *Mixing, Discharge(Water), *Water pollution, *Regulation, *Water quality control, Water manage-ment(Applied), *Waste water(Pollution), Stan-dards, Specifications, Waste water disposal, Pollution abatement, Thermal pollution, *Water quality standards, Legal aspects, State governments, Mixolimnion, Effluents.

Identifiers: Aquatic biology, Assimilation, Mixing zones, Time exposure history, Thermal discharges.

There is no uniform approach among states to the designation of zones to accommodate liquid waste discharges into an aquatic receiving system without interfering with other beneficial uses. This leads to confusion and indecision among dischargers and enforcement agencies. Acceptance of universally adaptable guidelines would initiate understanding and progress. Such conceptual guidelines are proposed, including: initial establishment of the waste capacity of the receiving system; control of mass emission rate of critical materials; adoption of aesthetic criteria; establishment of water quality requirements in the mixing zone based on time exposure history; derivation of specialized criteria to permit over-lapping mixing zones; assessment of damage to biota on a population basis; recognition that limited loss of living area may not be significant to populations; early acknowledgment that siting and discharge design can afford protection to uses; and that a case-by-case approach is essential to wise use of natural resources, even though it is more difficult than other ways of controlling zones. (See also W74-12174) (Brown-IPC) W74-12177

BIOLOGICAL MONITOR AQUATIC ENVIRONMENT, MONITORING OF THE Environmental Protection Agency, Cincinnati, Ohio. Analytical Quality Control Lab. For primary bibliographic entry see Field 5A. W74-12178

USE OF TOXICITY TESTS WITH FISH IN WATER POLLUTION CONTROL,
Newtown Fish Toxicology Lab. National Water Quality Lab., Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W74-12185

ECONOMIC EFFECTS OF SUBSIDIES FOR WASTE ABATEMENT,

Clemson Univ., S.C. Dept. of Economics. H. H. Macaulay.

H. H. Macaulay. Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-235 800, \$4.50 in paper copy, \$2.25 in microfiche. South Carolina Water Resources Research Institute Re-port No 43, Clemson, 115 p, 4 fig, 2 tables, 2 ap-pend, 40 ref, 1974. OWRT B-030-SC(6).

Descriptors: *Taxes, *Costs, Economics, Resources, Financing, Economic Efficiency, Cost allocation, Benefits, Investment, *Pollution abatement, *Pollution taxes(Charges), *Water quality

Identifiers: *Subsidies, *Charges, Externalities.

Environmental problems basically involve the use of environment by people and firms whose uses are often mutually exclusive. This approach has not been clearly seen because of an emphasis on (a) pollution rather than use of the environment, (b) compensation of victims of pollution instead of owners or the environment, (c) the public-good na-ture of the environment instead of its private-good aspects, and (c) technological externalities instead aspects, and cyclectinological externanties instead of pecuniary externalities created by other users. The asset-use approach supports user charges, while the case for subsidies must rest not on economic grounds but on equity or political grounds. However, both states and the Federal government grant to industries and municipalities. The value of the tax preferences given to industry has been insignificant relative to the expenditures required for pollution abatement, while those given to municipalities are now about \$4 to \$5 bil-lion annually. Each of these subsidies fails to discourage the creation of waste and encourages capital intensive waste treatment. The largest subsidies are those provided by regulations requiring firms and municipalities to treat wastes so that those who want clean water may enjoy it. These subsidies appear to be between \$3 and \$10 billion annually and apparently produce benefits of much less value than the sums spent.

W74-12199

STUDIES ON THE EFFECTS OF SEWAGE EF-FLUENT ON SELECTED GROUPS ARTHROPODS AND PHYTOPATHIC MATODES

Michigan State Univ., East Lansing. Dept. of En-

For primary bibliographic entry see Field 5C. W74-12202

RECLAMATION OF WATER FOR REUSE IN CHANNEL CATFISH RACEWAY SYSTEMS, Memphis State Univ., Tenn. Dept. of Biology.

B. A. Simco. Available from National Technical Information Service, Springfield, Va 22161 as PB-235 824, \$3.25 in paper copy; \$2.25 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report 39, August 1974, 29 p, 2 tab, 6 fig, 26 ref. OWRT B-028-Tenn(1), 14-31-0001-4127.

Descriptors: *Channel catfish, *Fish management, *Recirculated water, *Water reuse, *Filters, *Fish farming, Fish hatcheries, Production.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Identifiers: Fish cultures.

Channel catfish can be cultured at high densities in carefully managed recirculating raceway systems. Various flow rates, exchange rates, and tank to various flow lates, exchange faces, and take filter ratios were investigated in eleven recirculat-ing systems employing biological filters, settling chambers and foam strippers. Limestone, shells, styrofoam and teflon rings served as effective filter media, but coal slag restricted water flow and was not satisfactory. An equation was developed to evaluate the effects of system design on water quality. Water quality varies directly with fresh water exchange, flow rate per tank, and the filter size. Production was greater in systems with small tanks and large filters (5 lb/ft3) than in systems with large tanks and small filters (1 lb/ft3). Densities in excess of 7 lb/ft3 per tank have been obtained, indicating recirculating systems may become an increasingly important method of fish culture. W74-12203

PROCEEDINGS, SYMPOSIUM ON CONTROL INDUSTRIAL SOURCES.
For primary bibliographic entry see Field 5A.
W74-12208

WORKBOOK OF THERMAL PLUME PREDIC-TION, VOLUME 2, SURFACE DISCHARGES Pacific Northwest Environmental Research Lab.,

Facility Northwest Environmental Research Corvallis, Oreg. For primary bibliographic entry see Field 5B. W74-12212

AN EVALUATION OF TAILINGS PONDS SEA-

LANTS, Robert S. Kerr Environmental Research Lab.,

D. A. Clark, and J. E. Moyer. Available from GPO Sup Doc Copy Available from GPO Sup Doc as EPI.23:660/2-74-065, \$0.70, microfiche from NTIS, Springfield, Va 22161 as PB-235 929 \$2.25. Environmental Protection Agency, Technology Series, Report EPA-660/2-74-065, June 1974. 29 p. 2 fig. 2 tab, 29 ref. EPA Project 21AGF-16, Program Element 1BB040

Descriptors: *Linings, *Soil sealants, *Impervious membranes, Waste disposal, Liquid wastes, Solid wastes, Permeability, Seepage, Monitoring, Liquid limits, Plastics, Mine wastes, Costs, Sea-

lants, Seepage control.
Identifiers: Liner costs, Latexes, Fiberglass, Seepage detection, Mill tailings ponds.

A summary is presented of the rather limited information available in the literature pertaining to the use of sealants for mine and mill tailings ponds. Included is a discussion of currently employed seepage detection methods, as well as the various stepage detection includes, as well as the various types of sealants currently in use-compacted earth, clays, chemicals, waste tailings solids, asphalt, and synthetic liners will prevent all seepage. Installation costs of the sealants, including labor, are discussed and graphs for estimating costs based on pond size are presented. Regulations governing the amount of seepage allowed are ill-defined or non-existent in the majority of States. (EPA) W74-12217

DEVELOPMENT OF FIELD-APPLIED DDT, Envirogenics Systems Co., El Monte, Calif. K. H. Sweeny, J. R. Fischer, A. F. Graefe, D. H.

Liu, and H. J. Marcus.

Liu, and H. J. Marcus.
Copy Available from GPO Sup Doc as EP1.23:660/2-74-036, \$1.45; microfiche from NTIS, Springfield, Va 22161 as PB-235 943, \$2.25. Environmental Protection Agency, Technology Series Report EPA-660/2-74-036, May 1974. 95 p, 2 fig, 53 tab, 35 ref, append. EPA Contract 14-12-922, Program Element 1BB039.

Descriptors: *Pesticide removal, *DDT, *Reduction(Chemical), *Pesticide toxicity, Chlorinated hydrocarbon pesticides, *DDE, Pesti-cide kinetics, Water pollution control, Water pol-lution effects, Rainbow trout, Daphnia, Sun fishes, Reproduction, Minnows. Identifiers: *Pesticide degradation, TTTB.

Laboratory studies were carried out as a part of in-Laboratory studies were carried out as a part of intital development of a concept of controlled
destruction of field applied DDT pesticide. Copper
catalyzed aluminum reductant was shown to
degrade DDT in 24 hr at 25C and 4 hr at 40C
without forming DDE. Copper catalyzed iron
required a week to reduce DDT at 25C and 8 hr at
40C. Acidity for field degradation of DDT can be
supplied by solid acids such as sulfamic, oxalic, or
citics. An integrated degradable particle was citric. An integrated degradable particle was demonstrated by a 5 micrometer reductant particle overlaid with sulfamic acid and coated with DDT.

Only moisture is needed to initiate decomposition. Only moisture is needed to initiate decomposition. In a demonstration 98.4% of the DDT was destroyed in 6 days and 99.8% in 2 weeks at 25C. Product TTTB is 50-fold less fat soluble than DDT and nearly insoluble in water. Product DDE its 20-fold more soluble than DDT in water. The vapor pressure of DDEt is about 80-fold greater than DDT. Exposure of fathead minnows bluegills and rainbow frout to water saturated with DDEt (.05ppm) or TTTB (.001 ppm) produced no acute toxic effects. The TLm of DDEt to Daphnia is about 35 ppb. Long term chronic exposure of fathead minnows to DDEt saturated waters showed no effect on adult growth and survival, egg production or hatchability. Growth and survival of fearly had a surviv vival of freshly hatched fry were affected by DDEt above about .006 ppm. No effect on fathead minnow adult or fry growth and survival, egg production or hatchability was shown by TTTB saturated water. Nearly mature fathead minnows saturated water. Nearly mature ratineal minimover consumed 10 mg/kg body weight/day of DDEt to 980 mg/kg body weight/day of TTTB in food without apparent deleterious effect. (EPA) W74-12218

FEASIBILITY OF EMISSION STANDARDS BASED ON PARTICLE SIZE, Midwest Research Inst., Kansas City, Mo.

Midwest Research Inst., Kansas City, Mo.
L. J. Shannon, P. G. Forman, and W. Park.
Copy Available from GPO Sup Doc as
EPI.23:600/5-74-007, \$2.50; microfiche from
NTIS, Springfield, Va 22161 as PB-236 160, \$2.25.
Environmental Protection Agency,
Socioeconomic Studies Series, Report EPA-600/574-007, March 1974. 221 p, 25 fig, 53 tab, 89 ref, 3
append. EPA Program Element 1HA091, Contract
68.01-0428 68-01-0428

Descriptors: *Standards, *Air pollution, *Feasibility studies, *Particle size, Economic feasibility, *Regulation, Benefits, Pollutants. Identifiers: Particulates, *Emission standards, Technical feasibility, *Fine particle emissions.

The technical and economic feasibility of particulate emission standards based on particle size was assessed. Attention was focused on standards to assessed. Attention was rocused on standards to regulate the emission of fine particulates—particu-lates below 2 microns in size. The program was di-vided into four major areas of effort: (1) Analysis of approaches for regulating fine particle emis-sions from stationary sources. (2) Definition of ry for implementation of emission standards. (3) Identification of benefits that would accrue if control procedures for fine particulates can be implementation. mented. (4) Assessment overall feasibility of implementation of fine particle emission standards. W74-12219

NITROGEN AND PHOSPHORUS FROM AGRONOMY PLOTS IN ALABAMA, Alabama LOSSES NORTH

Alabama A and M Univ., Normal. For primary bibliographic entry see Field 5B.

ENVIRONMENTAL. GUIDELINES DEVELOPMENT ROADS IN THE SUBARCTIC, Environmental Protection Agency, College, Alaska. Arctic Environmental Research Lab. F. B. Lotspeich, and A. E. Helmers. Copy available from GPO Sup Doc as EP1.23:660/3-74-009, \$1.15; microfiche from NTIS as PB-235 932. Environmental Protection Agency, Ecological Research Series Report EPA-660/3-74-009, June 1974. 63 p, 42 fig, 20 ref. EPA Project 21ARX, Program Element 1BA021.

Descriptors: *Permafrost, *Erosion, Resources, *Access routes, Environmental control, Water quality, *Roads, *Subarctic, Sedimentation, *Standards, Regulation. Identifiers: Thermal erosion.

This set of guidelines is based on Federal and State regulations that set standards to protect the total environment. Although major highway construction is under stringent regulation, pioneer type ac-cess roads such as are needed by loggers, miners, land developers, etc., have been neglected. These smaller roads frequently pose serious erosion hazards because planning, design, and construction of them is not thorough, as it is for major roads; this results in erosion, fire and insect traps, and generally unattractive roadways. Suggestions and recommendations contained in these guidelines are for the use of operators with limited engineering and planning staffs. Although all ex-amples of poor practices are from the vicinity of Fairbanks, all suggested treatments are taken from the literature from the conterminous United States, with some modifications for subarctic conditions. Most of these recommendations are simple in concept, and if properly applied, do prevent erosion and result in superior access roads which are esthetically pleasing. (EPA) W74-12223

PHYTOPLANKTON NUTRITION AND PHOTOSYNTHESIS IN LAKE MINNETONKA AND LAKES AT FAIRMONT, MINNESOTA, Minnesota Univ., Minneapolis. Dept. of Ecology and Behavioral Biology. For primary bibliographic entry see Field 5C. W74-12227

PHOSPHATE REMOVAL BY SANDS AND New York State Dept. of Environmental Conser-

vation, Albany. For primary bibliographic entry see Field 5E. W74-12235

WEBER RIVER BASIN INCLUDING DAVIS COUNTY AND THE OGDEN S.M.S.A.: WATER QUALITY MANAGEMENT PLANNING, PHASE

Stevens, Thompson and Runyan, Inc., Portland, Oreg. and Nielsen, Maxwell and Wangsgard, Inc., Salt Lake City, Utah. For primary bibliographic entry see Field 6A. W74-12238

TERM TREATMENT SHORT MALACHITE GREEN AND FORMALIN FOR THE CONTROL OF ICHTHYOPHTHIRIUS MULTIFILIIS ON CHANNEL CATFISH IN HOLDING TANKS, Alabama Univ., Ala. Dept. of Fisheries and Allied

Aquacultures. J. H. Schachte, Jr.

The Progressive Fish-Culturist, Vol 36, No 2, p 103-104, April 1974, 4 ref.

Descriptors: *Channel catfish, *Fish parasites, *Protozoa, Pesticides, Pest control, Fish farming, Catfishes, Parasitism, Biocontrol, Diseases, Toxicology, Mortality, Fish diseases, Fishkill, Antiprotozoals(Pesticides), Microorganisms.

Identifiers: *Ichthyophthirius multifiliis, Formalin, Malachite green, Trophozoites.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

Infection of the ciliated protozoan parasite, Ichthyophthirius multifiliis, in holding tanks was controlled by a combination of malachite green and formalin. A mixture of 0.1 ppm malachite green and 15 ppm formalin brought the infestation under control in four days. (Katz)

PERCEPTION OF WATER QUALITY BY SELECT RESPONDENT GROUPINGS IN IN-LAND WATER-BASED RECREATIONAL EN-VIRONMENTS

Rensselaer Polytechnic Inst., Troy, N.Y. Fresh-

Water Resources Bulletin, American Water Resources Bulletin, American Water Resources Association, Vol 10, No 4, p 728-744, August 1974. 6 fig, 5 tab, 13 ref.

Descriptors: *Trophic level, *Recreation, *Lakes, *Water quality, *Water users, *Data processing, Fishing, Eutrophication, Oligotrophy, Statistics, Water sports, Attitudes, Ecology, Sampling, Data collection, *New York.

Identifiers: Lake George(NY), Oneida Lake(NY), Saratoga Lake(NY), Schroon Lake(NY), Cluster

Data on perceptions of water quality in oligotrophic and eutrophic lakes were obtained from a questionnaire survey of several user groups in New York state. The responses of recreationists, cottage and homeowners, and fishermen were compared utilizing percentage response profiles and cluster level groupings. The survey examined four lake environments which were paired by size and each pair contained both trophic paired by size and each pair contained both trophic states. The large-size pair were Lake George (oligotrophic) and Oneida Lake (eutrophic). The intermediate-size pair were Schroon Lake (oligotrophic) and Saratoga Lake (eutrophic). Partial analysis of the data indicated that the selected lakes are reasonable trophic state and points for polarizing user group attitudes toward water quality. Each user group surveyed appeared sensitive to select water quality parameters; where shifts in sensitivity appear within the between user groups with changes in ecological settings, as well as with factors independent of ecological settings. (Harmeson-ISWS) W74-12287

THE ELECTRICAL PROCESS IN THE BREAK-ING OF DILUTE OIL-IN-WATER EMULSIONS, Georgia Inst. of Tech., Atlanta. High Temperature For primary bibliographic entry see Field 5D. W74-12343

FEASIBILITY STUDY TO DEVELOP GUIDELINES FOR LAKE AND RELATED LAND RESOURCE USE DEVELOPMENT RESEARCH, OR ECONOMIC AND ECOLOGI-CAL IMPACT OF VARIOUS FORMS OF LAKE RESOURCE DEVELOPMENT, New Hampshire Univ., Durham. Water Resource

Research Center.
For primary bibliographic entry see Field 2H. W74-12350

WATER RESOURCES PROTECTION MEASURES IN LAND DEVELOPMENT - A HAND-

Delaware Univ., Newark. Water Resources

J. Tourbier, and R. Westmacott.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 049, \$6.50 in paper copy, \$2.25 in microfiche. Completion Report, April 1974. 237 p, 36 fig. OWRT C-4247(No. 9036)(1).

Descriptors: *Design criteria, *Measurement, *Protection, *Environmental control, Urban ru-

noff, Infiltration, Erosion, Sediment yield, Flooding, Sewage disposal, Legal aspects, *Comprehensive planning, Land development, *Delaware, *Integrated control measures, Water pollution control.

Identifiers: *Christina River Basin(Del), New Cas-

tle County(Del), Urban development.

A description is presented of measures that can become in integrated part of urban development to lessen problems that would otherwise adversely affect water resources. These problems consist of runoff increases and decreases in infiltration and a greater degree of erosion and sedimentation, flooding, runoff pollution and discharge of sewage effluent. Issues have been analyzed individually in the Christina River Basin and, where possible, quantified. Measures are presented in groups and related directly to the problems listed above. Each group is preceded by a flow chart that relates individual measures to each other, and can aid in the selection of alternative techniques that follow a logical sequence. Each measure has been described, and site characteristics to which it is applicable, identified. The application, advantages and disadvantages, design criteria and outline specifications, cost guidelines and maintenance, and legal implementation of each measure are individually covered. Illustrated case studies give examples of measures which have been con-structed in the field. Legal implications of implementation on the county, State and regional level are described. The State of Delaware is used as an example. W74-12352

FIELD TEST OF AN ENVIRONMENTAL IM-Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 6G.

W74-12357

WATER QUALITY IMPROVEMENT OF STRATIFIED IMPOUNDMENTS BY SELECTIVE WITHDRAWAL OF BOTTOM WATERS, Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.

P. L. Monkmeyer, J. A. Hoopes, K. V. R. Henkel, J. C. Ho, and G. R. Clark.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 043, \$3.75 in paper copy, \$2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report 74-05. Partial Completion Report, July, 1974. 67 p. 16 fig, 43 ref. OWRT B-080-WIS(3). 14-31-0001-3948.

Model studies. Hydraulics. Descriptors: Descriptors: Model studies, Hydraulics, *Impoundments, *Stratified flow, *Withdrawal, *Destratification, *Water quality, Lakes, Reservoirs, Water pollution control, Forecasting. Identifiers: *Selective withdrawal. Rottom withdrawal.

A variety of methods have been proposed to im-prove the water quality of lakes and reservoirs. The work described is directed toward the overall improvement of water quality in a reservoir through the removal of the poor quality, hypolimetic water. In particular, theoretical and experimental investigations on selective withdrawal of a viscous, non-diffusive, linearly-stratified fluid from the bottom of a reservoir have been carried out. The governing differential equations which describe planner and axisymmetric withdrawal are derived. In each case, an assumed horizonatal velocity profile is substituted into the integral form of the momentum equation; the resulting ordinary differential equation is solved numerically to give the variation with distance from the outlet of the thickness of the layer of hypolimnetic water withdrawn. Using the assumed velocity profile and the principle of mass conservation, expressions are derived in each case to predict the quality of the water withdrawn. Laboratory experiments are conducted; the results obtained verify the theoretical predictions. Procedures for predicting the withdrawal layer thickness and discharged water quality in an actual reservoir are discussed. W74-12370

PROCEEDINGS OF THE XV EUCEPA CON-FERENCE ON HARMONIZING PULP AND PAPER INDUSTRY WITH ENVIRONMENT,

Held in Rome, Italy, May 7-11, 1973, by ATICEL-CA (Associazione Tecnica Italiana per la Cellulosa e la Carta), Rome, Italy, in cooperation with FAO, 1973. 806 p.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Conferences, *Water pollution control, Legal aspects, Economics, Water managewastes, "Conferences, "Water pollution control, Legal aspects, Economics, Water manage-ment(Applied), Waste water(Pollution), Pollution abatement, Europe, Water supply, Industrial wastes, Treatment facilities, Water conservation, Industrial water, Air pollution, Waste water treat-ment, Water conservation, Water reuse, Water quality control, "Environment.

Cosponsored by FAO (Food and Agriculture Organization of the United Nations) and ATICELCA (Comite Europeen de Liaison pour la Cellulose et le Papier) Conference was dedicated to environmental problems of the paper and allied industries. Numerous technical presentations dealt with technological, economic, and legislative aspects of water and air pollution control in the paper industries of various countries, not only in Europe, but also in the USSR and North America. Most of the printed contributions and their subsequent discussions from the floor are reproduced in English, a few being given in French or German. (See W74-12401 thru W74-12431) (Brown-IPC) W74-12400

TECHNICAL REPORT F STOCKHOLM UN CONFERENCI FROM Swedish Water and Air Pollution Research Lab.,

Stockholm. For primary bibliographic entry see Field 6G. W74-12401

SURVEY OF ENVIRONMENTAL LEGISLA-TION IN THE GERMAN FEDERAL REPUBLIC (UEBERSICHT UEBER DIE UMWELTGESETZ-GEBUNG IN DER DEUTSCHLAND). BUNDESREPUBLIK

Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle. For primary bibliographic entry see Field 6E. W74-12402

FRENCH LEGISLATION AND POLICIES RE-GARDING ENVIRONMENTAL PROTECTION (LEGISLATION ET POLITIQUE FRANCAISES EN MATIERE DE PROTECTION DE

L'ENVIRONNEMENT), Societe Aussedat-Rey, Saillat (France). For primary bibliographic entry see Field 6E. W74-12403

LEGISLATION ON ENVIRONMENTAL PRO-TECTION IN SCANDINAVIA, National Water Board of Finland, Helsinki For primary bibliographic entry see Field 6E.

CANADA'S APPROACH TO ENVIRONMENTAL POLLUTION CONTROL FOR THE PULP AND

PAPER INDUSTRY, Environmental Protection Service, Ottawa

L. Edgeworth. In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 103-109,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Descriptors: *Legislation, *Pulp wastes, *Pollution abatement, *Environmental control, *Canada, Governments, Regulation, Pulp and paper industry, Waste water treatment, Water pollution control, Water quality standards, Standards, Industrial wastes, Water quality control.

Key characteristics of Canada's federal and provincial antipollution regulations include: (1) a program of point source control, (2) bases founded on best practicable technology, (3) distinctions between older and newly constructed pulp and paper mills, (4) uniform standards for minimum wastewater quality across all of Canada, and (5) decisions based on input from both government and industry. (See also W74-12400) (Brown-IPC) W74-12405

INFLUENCE OF THE WATER POLLUTION, World Health Organization, (Denmark). Regional Office for Europe. For primary bibliographic entry see Field 5C. W74-12406

A TOTAL PROCESS APPROACH TO WATER AND WASTE MANAGEMENT IN AN EXPAND-ING FINE PAPER MILL, Papeteries de Virginal (Belgium). For primary bibliographic entry see Field 5D. W74-12407

THE POLLUTION-FREE MILL: FACTS AND VISIONS,
Lekanders Ingeniorsbyra A.B., Alingas (Sweden).

Lekanders Ingenjorsbyra A.B., Alingas (Sweden) For primary bibliographic entry see Field 5D. W74-12408

TREATMENT OF CONDENSATE, Angpanneforeningen, Stockholm (Sweden). For primary bibliographic entry see Field 5D. W74-12409

SOME SYSTEMS DEVELOPED FOR POLLU-TION ABATEMENT IN THE PULP INDUSTRY, PARTICULARLY OXYGEN BLEACHING, Mo Och Domsjo A.B., Ornskoldsvik (Sweden). For primary bibliographic entry see Field 5D. W74-12410

PULP MILL WATER SYSTEM CLOSURE, Swedish Forest Products Research Lab., Stockholm. For primary bibliographic entry see Field 5D. W74-12411

ESTABLISHMENT OF A CLOSED SYSTEM FOR THE PAPER MAKING PROCESS, For primary bibliographic entry see Field 5D. W74-12412

DESIGN PRINCIPLES OF WHITE WATER SYSTEMS WITH SPECIAL REFERENCE TO EFFLUENT CONTROL, Jaakko Poyry and Co., Helsinki (Finland). For primary bibliographic entry see Field 5D. W74-12413

FRACTIONAL INPLANT TREATMENT OF RECYCLE FLOWS BY ADVANCED TECHNIQUES, Institute of Paper Chemistry, Appleton, Wis. For primary bibliographic entry see Field 5D. W74-12414

CLARIFICATION OF WHITE WATER BY VACUUM FILTRATION (KLAERUNG VON WEISSWASSER DURCH VAKUUM-FILTRATION),

For primary bibliographic entry see Field 5D.

W74-12415

EFFECTS OF RAW MATERIALS AND CHEMICAL ADDITIVES ON MILL EFFLUENT LOSSES, Research Association for the Paper and Board, Printing and Packaging Industries, Leatherhead

(England). For primary bibliographic entry see Field 5D. W74-12416

THE TREATMENT AND REMOVAL OF WASTE WATER RESIDUAL SLUDGES IN THE PAPER INDUSTRY (DIE BEHANDLUNG UND BESEITIGUNG VON RESTABWASSERSCHLAEMMEN DER PAPIERINDUSTRIE), Muenchen-Dachauer Papierfabriken Heinrich Nicolaus G.m.b.H. (West Germany). For primary bibliographic entry see Field 5E. W74-12417

MECHANICAL TREATMENT OF PULP AND PAPER MILL EFFLUENT, Nevalainen and Orivuori, Helsinki (Finland). For primary bibliographic entry see Field 5D.

STUDY ON THE TOXICITY ON FISHES AND THE BIODEGRADABILITY OF THE PAPER-MILL WASTES, IN RELATION TO THE BIOCIDES USED, Ente Nazionale per la Cellulosa e per la Carta,

Ente Nazionale per la Cellulosa e per la Carta Rome (Italy). For primary bibliographic entry see Field 5C. W74-12419

THE USE OF SILICATES AND POLYELEC-TROLYTES FOR FLOCCULATION, Papiripari Vallalat Kutato- es Fejlesztointezete, Budapest (Hungary). For primary bibliographic entry see Field 5D. W74-12420

THE BIOLOGICAL PURIFICATION OF PAPER INDUSTRY WASTE WATERS (DIE BIOLOGISCHE REINIGUNG VON RESTABWAESSERN DER PAPIERINDUSTRIE), Cellulose Attisholz A.G., Luterbach (Switzerland). For primary bibliographic entry see Field 5D. W74-12421

TERTIARY METHODS OF WASTE TREAT-MENT, Balfour-Italia, Rome (Italy). For primary bibliographic entry see Field 5D. W74-12422

ACTIVATED CARBON AND OTHER TECHNIQUES FOR COLOR REMOVAL FROM KRAFT MILL EFFLUENTS, Saint Regis Paper Co., Pensacola, Fla. For primary bibliographic entry see Field 5D. W74-12423

NEW FINE PARTICLE TECHNOLOGIES AP-PLIED TO THE ENVIRONMENTAL PROBLEMS OF THE PAPER INDUSTRY, English China Clays Ltd., Saint Austell (England). For primary bibliographic entry see Field 5D. W74-12424

A STUDY OF THE EFFLUENT TREATMENT FROM AN ITALIAN PAPER MILL, Cartiera del Timavo, Trieste (Italy). For primary bibliographic entry see Field 5D. W74-12425 IMPACT OF POLLUTION ABATEMENT ON CAPITAL ALLOCATION AND PROFITABILITY

Canadian Pulp and Paper Association, Montreal (Ouebec).

(Queoec).
D. Jones, H. D. Paavila, and F. G. Hurtubise.
In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environment; held in Rome, May 7 to 11, 1973, p 739-746, 1973.

Descriptors: *Pulp wastes, *Bleaching wastes, *Pollution abatement, *Water pollution control, Costs, *Capital costs, Economics, Treatment facilities, *Canada, Pulp and paper industry. Identifiers: Profits.

Comments from officials of seven Canadian paper companies regarding the capital and operating costs of antipollution installations are cited to document the considerable impact of such expenditures on company profits and competitive ability. (See also W74-12400) (Brown-IPC) W74-12426

THE ROLE OF THE CHEMICALS USED IN PAPER AND PAPER BOARD MAKING IN MINIMISING EFFLUENT PROBLEMS,

Imperial Chemical Industries Ltd., London (England). J. P. Gill.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environment; held in Rome, May 7 to 11, 1973, p 753-762, 1973.

Descriptors: *Biodegradation, *Pulp wastes, *Pollution abatement, *Pulp and paper industry, *Additives, *Chemicals, *Pesticides, Water pollution control, Industrial wastes.

Identifiers: Size-press(Paper machine), Wetend(Paper machine), Slimicides, Retention aids, White water(Paper machine effluent), Closed systems.

Papermaking chemicals can be classified into processing aids and functional or special-purpose additives. Correct selection and controlled dosage of such compounds will achieve optimum retention or solids in the paper sheet, especially in conjunction with retention aids. Closure of the white water system of paper machines is possible by use of slimicides for control of undesirable deposits. Effluent volumes can be reduced also by applying functional additives on the size-press (that is, after the fiber web has been formed), rather than on the wet-end (that is, to the aqueous fiber suspension). Pollution problems can be minimized by development of special biocides and other compounds that are readily biodegradable. Contributions of a British chemical supplier in these areas are indicated. (See also W74-12400) (Brown-IPC)

SYSTEM OF COMBINED AND PROFOUND TREATMENT OF PULP AND PAPER INDUSTRY WASTE WATERS WITH ACTIVATED SLUDGE.

Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost, Moscow (USSR). For primary bibliographic entry see Field 5D. W74-12428

A PILOT PLANT STUDY FOR THE TREAT-MENT OF PAPERMILL AND DEINKING EF-FLUENTS.

American-Israeli Paper Mills Ltd., Hadera (Israel). For primary bibliographic entry see Field 5D. W74-12429

RECENT DEVELOPMENTS IN PAPER MILL EFFLUENT TREATMENT IN FRANCE (DEVELOPPEMENTS RECENTS DU TRAITE-

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

MENT DES EFFLUENTS DE PAPETERIE EN FRANCE).

Societe Degremont, Paris (France). For primary bibliographic entry see Field 5D.

AN INTERESTING METHOD OF ABATING POLLUTION IN THE PULP AND PAPER IN-

Ecolgenova, S.p.A., Genoa (Italy). For primary bibliographic entry see Field 5D. W74-12431

DEVICE FOR RECOVERING FLOATING MATTER FROM WATER SURFACE,

Bridgestone Tire Co. Ltd., Tokyo (Japan). (assignee) K. Aramaki, H. Kawakami, and Y. Kawaguchi

U.S. Patent No 3,812,968, 6 p, 15 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 922, No 4, p 1137, May 28, 1974.

Descriptors: *Patents, *Flotsam, *Pollution abatement, *Oil pollution, Water quality control, Water pollution control, Equipment.

The device for recovering floating matter from a water surface comprises a floating frame body, a bucket directed downward. A feeder secured to the frame body in the proximity of the bucket feeds the floating matter to an inlet opening in the bucket. The feeder consists of an endless belt which has an absorptive member secured to the outer surface. There is at least one squeezing roller engaging the endless belt. The belt moves along a closed loop extending from a point above water level to the proximity of the inlet in the bucket. A whirl-generator may be placed within the bucket. (Sinha-OEIS) W74-12432

APPARATUS FOR CONTROLLING A POLLUT-ING LIQUID, Shell Oil Co., New York. J. P. Oxenham.

U.S. Patent No 3,810,546, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 922, No 2, p 523, May 14, 1974.

Descriptors: *Patents, *Skimming, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, Flotsam, Equipment, Separation techniques.

The skimmer comprises a platform having floats and rotatable drums spaced about the periphery of the platform. The drums face in mutually perpendicular directions. Each drum has a weir positioned adjacent to the interface of the liquids to allow a substantial amount of the polluting liquid to pass into the drums. Each of the drums is mounted for rotation about the axis by a suitable shaft and supports on the platform. The skimmer is arranged to remove the polluting liquid from all directions. (Sinha-OEIS) W74-12436

OIL/WATER SEPARATION ACCELERATION MEDIA, Oil Mop, Inc., New Orleans, La.

H. M. Rhodes. U.S. Patent No 3,810,832, 2 p, 9 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 922, No 2, p 593, May 14, 1974.

Descriptors: *Patents, *Oily water, Water quality control, Waste water treatment, *Pollution abatement, Water pollution control, *Separation techniques

The oil and water mixture is directed through a barrier of filaments of polypropylene arranged across the path of mixture. The barrier is anchored at its base at the bottom of the fluid holding pond.

The free ends of the strips of polypropylene are directed upward forming an inclined plane up which the oil droplets amalgamate assisted by the buoyancy of the oil and the force flow vector of the mixture passing through the fluid holding pond. (Sinha-OEIS) W74-12437

METHOD AND A DEVICE FOR COLLECTING SUBSTANCES FLOATING IN A LIQUID SUR-FACE.

H. L. Bergman.

U.S. Patent No, 3,817,385, 4 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 923, No 3, p 950, June 18, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Flotsam, *Pollution abatement, Water quality control, Water pollution control, Equipment, Separation techniques.

The collecting device is carried on a ship and is provided with a supply of paper rolls. The collecting device comprises a conveyor in the form of an endless band of a suitable material which is adapted to run around two spaced rollers. The conveyor band may be driven conveniently by causing one of the rollers to rotate by means of a motor The two rollers are mutually connected to a rigid assembly by means of a frame so that one end of the conveyor can be placed in the water while the other end of the conveyer is located adjacent to a collecting table, which makes it possible to transfer the material transported by the conveyor to a collecting receptacle. At its end immersed in the water, the conveyor frame is provided with two guide plates arranged in V-form to guide float-ing substances on the water surface in the direction of the conveyor. (Sinha-OEIS) W74-12446

OIL/WATER SEPARATION AND RECOVERY

SYSTEM,
Pollution Recovery Systems, Okland, Calif. J. D. Pavolvic.

U.S. Patent No. 3,815,751, 9 p, 14 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 923, No 2, p 550, June 11, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water quality control, Water pollution control, Equipment, *Separation techniques. Identifiers: *Oil waste recovery.

A separating tank is provided having first and second sections partially separated by a wall extending across the tank. An intake channel directs the flow of fluids downward, permitting contact between the lower density fluid flowing in the channel and a layer of the lower density fluid maintained in the tank, so as to capture the major portion of the entering lower density fluid. The higher density fluid plus entrained lower density fluid is directed downward into the second section and assumes a tortuous path over the wall into the first section, while the lower density fluid escapes upwards into the layer of the lower density fluid. The separating tank is mounted in a vessel below fluid level and the intake channel connected to a flexible articulated trough which is controlled to maintain a relatively constant level of fluid, until the fluid reaches the downward curing portion of the channel. A flexible boom is provided for containing the oil or other fluid in anticipation of or during the removal and separation operation. (Sinha-OEIS) W74-12451

APPARATUS FOR AND METHOD OF AUTO-MATICALLY REMOVING FROM A FLOWING STREAM, POLLUTANTS

ociete Alsthom, Grenoble (France).

J. L. Dubouchet.

U.S. Patent No 3,815,742, 4 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 923, No 2, p 547, June 11, 1974.

Descriptors: *Patents, *Flotsam, *Oily wastes, Waste water treatment, Liquid wastes, *Pollution abatement, Water pollution control, Water quality control, *Separation techniques

A separator is used so that there may be by-passed or diverted thereinto a portion of the tap of a stream on which flotsam has collected. At the downstream end of the separator, is a vertical liquid chamber. Associated with this chamber are means for permitting the discharge of separated liquid from it supper portion while maintaining the level of the liquid at a given constant above the maximum height of any interface that may exist between the liquid and pollutant material. (Sinha-W74-12453

FINAL CONFERENCE REPORT FOR THE NA-TIONAL CONFERENCE ON MANAGING THE ENVIRONMENT.

For primary bibliographic entry see Field 6G. W74-12457

BEYOND THE BRUSHFIRES,

Environmental Protection Agency, Washington, For primary bibliographic entry see Field 6G. W74-12458

MANAGEMENT FOR THE FUTURE, Council on Environmental Quality, Washington, For primary bibliographic entry see Field 6G. W74-12459

THE ECONOMICS OF ECOLOGY, Colorado Univ., Boulder. For primary bibliographic entry see Field 6G.

PLANNING FOR QUALITY GROWTH, Hawaii State Dept. of Planning and Economic Development, Honolulu. For primary bibliographic entry see Field 6G. W74-12461

STATE GOVERNMENTS TACKLE POLLU-TION.

Scholars, Washington, D.C. For primary bibliographic entry see Field 6G. W74-12465 Wilson International Center for

IMPLEMENTATION OF CITIZEN PARTICIPA-TION IN THE MUNICIPAL PROCESS, Environmental Protection Agency, Washington, D.C. Technical Assistance Research Programs. For primary bibliographic entry see Field 6G. W74-12468

FIXED VERSUS VARIABLE ENVIRONMENTAL STANDARDS, MITRE Corp., McLean, Va. For primary bibliographic entry see Field 6G. W74-12470

THE STRATEGIC ENVIRONMENTAL ASSESS-MENT SYSTEM (SEAS): A RESEARCH PRO-

Environmental Protection Agency, Washington, D.C. For primary bibliographic entry see Field 6B. W74-12472

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

OIL/WATER

Water Quality Control—Group 5G

DETECTOR

UNRECORDED POLLUTION FROM URBAN

RUNOFF, Rutgers-The State Univ., New Brunswick, N. J., Water Resources Research Inst. W. Whipple, J. V. Hunter, and S. L. Yu. Volume of the Water Pollution Control Federation, Vol 46, No 5, p 873-885, May, 1974. 6 fig, 2 tab, 22 ref. OWRR A-025-NJ(5).

Descriptors: *Urban runoff, *Urban planning, *Waste disposal, *Water pollution sources, Pollution, Wastes, Streams, Biochemical oxygen demand, Planning. Identifiers: Waste recording.

A study has been done on unrecorded pollution caused by concentrations of urban populations. It was concluded that in the case of developing urban areas when the stage of secondary treatment of recorded wastes is arrived at, the unrecorded pol-lution sources will account for more than half of the pollution in streams. These unrecorded wastes will be found too large to be ignored in planning. An approximation of unrecorded BOD loading of 0.02 to 0.03 lb/day/person may be used for clean residential urban development. (Murphy-FIRL) W74-12523

OIL, GAS, AND WATER LAW-TODAY AND TOMORROW, Gee and Hearon, Austin, Tex.

For primary bibliographic entry see Field 6E.

WHAT EXPLORATION GEOLOGISTS SHOULD KNOW ABOUT POLLUTION, Texas Univ., Austin. Center for Research in Water

Resources For primary bibliographic entry see Field 5B. W74-12548

OIL AND GAS VERSUS WATER IN THE SOUTHWEST: CONFLICT OR COMPROMISE. Humble Oil and Refining Co., Corpus Christi, Tex. For primary bibliographic entry see Field 6E. W74-12549

WATER POLLUTION POLICY. For primary bibliographic entry see Field 6E. W74-12604

DEPOSITING TRASH, GARBAGE, ETC., ON LANDS OF ANOTHER OR IN WATERS OF THE STATE.

For primary bibliographic entry see Field 6E. W74-12605

WATER AND WATER SUPPLY POLLUTION. For primary bibliographic entry see Field 6E. W74-12606

POTOMAC VALLEY CONSERVANCY DIS-

Committee on Public Works, (U.S. House). For primary bibliographic entry see Field 6E. W74-12608

W74-12610

WATER BANK ACT--REPORT. Committee on Agriculture and Forestry (U.S. For primary bibliographic entry see Field 6E.

OCEAN DUMPING CONVENTION IMPLEMEN-

TATION. Committee on Merchant Marine and Fisheries (U.S. House). For primary bibliographic entry see Field 6E. W74-12611

HIGH SEAS OIL PORT ACT.

For primary bibliographic entry see Field 6E. W74-12615

A PLAN FOR MICHIGAN'S SHORELANDS. Michigan Dept. of Natural Resources, Lansing. For primary bibliographic entry see Field 6E. W74-12616

SURVEY OF ENVIRONMENTAL LEGISLA-For primary bibliographic entry see Field 6G. W74-12618

DEEPWATER PORTS.

For primary bibliographic entry see Field 6E. W74-12619

CORPS OF ENGINEERS DREDGE AND FILL JURISDICTION: BUTTRESSING A CITADEL UNDER SIEGE,

W. C. Hoyer. University of Florida Law Review, Vol 26, No 1, p 19-40, Fall 1973. 125 ref.

Descriptors: *Wildlife conservation, *Shorelines, *Construction, *Administration, *Regulation, **Construction, **Administration, **Regulation, Federal government, Legislation, Tidal wetlands, Aquatic habitats, Water resources development, Recreation, Institutional constraints, Administrative agencies, Political aspects, Adoption of prac-tices, Aesthetics, Ecology, Coastlines, Legal aspects, Planning, Waste water pollution, Water

Identifiers: *Coastal waters, *Fill permits, *Administrative regulations.

Coastal and estuarine wetlands are vital to the survival of fish and wildlife. They also have a func-tion in controlling floods and tidal forces. All of the nation's shorelines are facing pollution or development. Uncontrolled and unplanned dredging and filling of these areas have resulted in a depletion of aquatic resources. Unspoiled beach and shore areas available for public use are becoming scarce. The United States Army Corps of Engineers has major statutory responsibility for most of these shorelands. Work in waterways where the Corps has jurisdiction is subject to Corps approval. The Corps thus plays a role requiring significant environmental responsibility. Being a developer, itself, the Corps has not traditionally been oriented toward resource conserva-tion. The Corps is not presently administratively organized to evaluate ecological factors fairly. The organized to evaluate econogical ractors fairly. The Corps is being impaled by environmentalists for its lack of aggressiveness, at the same time being criticised by developers for lack of clarity and con-sistency. The basis for Corps of Engineers ju-risdiction over dredge and fill projects is ex-mined, and the avancing of the investigation into amined, and the expansion of that jurisdiction into the environmental arena is traced. (Sperling-Florida) W74-12620

OIL SPILLS: HOW SERIOUS A PROBLEM. For primary bibliographic entry see Field 5B. W74-12621

DEFENSE ENVIRONMENTAL FUND FROEHLKE (REQUIREMENTS FOR ENVIRON-MENTAL IMPACT STATEMENTS).
For primary bibliographic entry see Field 6E. W74-12623

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1972 - NOVEMBER 30, 1973. For primary bibliographic entry see Field 4A. W74-12634 Office of Delaware River Master, Milford, Pa.

INTERFACE LABORATORY EVALUATION. Esso Research and Engineering Co., Florham, N.I. For primary bibliographic entry see Field 5A. W74-12637

AIR POLLUTION FROM FUEL COMBUSTION IN STATIONARY SOURCES.

Processes Research, Inc., Research Triangle Park, N.C. Industrial Planning and Research. N.C. industrial Planning and Research.
Available from NTIS, Springfield, Va 22161 as
PB-222 341, Price \$4.25 printed copy; \$2.25
microfiche. Final Report EPA R2-73-241, on UP
National Report to OECD Joint Group on Air Pollution from Fuel Combustion in Stationary
Sources Cottober 1072, 1909-2 Sources, October 1972, 109 p.

Descriptors: *Air pollution, *Sulfur, *Nitrogen, Dusts, *Pollution abatement, Sampling, Planning,

Identifiers: Air pollution control, Combustion.

Estimates are given of past and future fuel consumption in stationary combustion sources and of the associated quantities of the air pollutants-sul-fur oxides, nitrogen oxides, and particulate-emitted to the atmosphere from the combustion of these fuels. Abatement strategies to control the 1980 level of pollutant emissions are proposed. The projected emissions of sulfur and nitroge The projected emissions of sulfur and nitrogen oxides could be expected to approximately double the 1968 levels of pollution without implementation of new controls. Those of particulate emissions are expected to increase some tenfold without the best control practices. The 1980 emissions can be controlled to the targeted levels through implementation of control and fuels management practices. The estimated costs for achieving control approach a total estimated capital expenditure of about \$13 billion achieving control approach a total estimated capital expenditure of about \$13 billion (cumulative through 1980) and an annual operating cost climbing to \$2.8 billion in 1980 (1970 dollar estimates). (Knapp-USGS)

EVALUATION OF CONCEPTS FOR SEPARAT-ING OIL FROM WATER DISCHARGED FROM

Coast Guard, Washington, D.C. Office of Research and Development.

W. C. McKay. Available from NTIS, Springfield, Va. 22161 as AD-770 346, Price \$4.25 printed copy, \$2.25 microfiche. Technical Report, August 1973. 117 p,

Descriptors: *Oily water, *Ships, *Water pollution control, *Separation techniques, Waste water treatment, Pollution abatement.

Methods for separating oil from water discharged from ships were tested. The eight systems evaluated are: tubular membrane separator, centrifugal coalescer separator, laminar flow coalescing plate separator, ultrafiltration separator, electrochemi-cal flotation separator, vacuum desorption air flotation separator, vacuum desorption air cal lotation separator, vacuum desorption air flotation separation, viscosity separation, and vor-tex separation. It is essential that oil-water mix-tures be emulsified as little as possible prior to separation. Emulsification of the mixture can be reduced by the elimination of detergent cleaning reduced by the elimination of detergent cleaning agents, by the de-rating of centrifugal pumps to 50% of the designed rpm, and when practical, locating the pump after the separator. Ultrafiltration systems and the electroflotation systems consistently produced high quality effluent discharges with less than 10 parts per million of oil. Centrifugal systems are most suited for high volume ballast water cleaning systems because of their small size and high flow capability. Laminar-flow, parallel-plate separators offer possibilities for separating oil from ballast water when the oil-water mixture is not emulsified. Cartridge coalescers can meet effluent discharge standards, when operated to prevent ingestion of detergents and to reduce mechanical mixing of the influent. (Knapp-USGS)

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

W74-12642

ASSESSMENT OF BIODEGRADATION POTEN-TIAL FOR CONTROLLING OIL SPILLS ON THE HIGH SEAS,

Oklahoma State Univ., Stillwater. Dept. of Biochemistry.

R. K. Gholson, P. Guire, and J. Friede. Available from NTIS, Springfield, Va. 22161 as AD-759 848, Price \$5.45 printed copy, \$2.25 microfiche. Contract Report for US Coast Guard,

September 1972. 130 p, 19 fig, 4 tab, 203 ref. DOT-CG Contract 20, 260-A.

spills, *Oil *Oilv Descriptors: water. *Biodegradation, *Water pollution control, Water pollution treatment, Aquatic microorganisms, Reviews, Research and development.

Research work related to the problem of the biodegradation of marine oil spills was reviewed to determine the practical feasibility of controlling oil spills and residues by biodegradation and to define those areas requiring additional research and development. There are several means by which crude oil and refined petroleum products may be introduced into the marine environment. First, there are shipping disasters, of which the Torrey Canyon and the Tampico Maru are recent notable examples. A second kind of accident which can result in large quantities of crude oil being released into the sea is an uncontrolled seep occurring when a new oil well is being sunk on the Continental Shelf. However, a greater total amount of oil pollution may result from deliberate release of many small quantities of oil onto the sea by tankers and other cargo vessels. Also, the loading and unloading of oil cargo constitutes a hazard in harbors and ports. Oil pollution of the ocean also occurs from runoff by way of rivers and sewage systems. Many natural oil seeps on the ocean floor constitute another continuous source of petroleum entering the marine environment. Natural processes cause the oil to disappear. These processes include disposal by evaporation, emulsification, sinking and beaching of the oil components and destruction by oxidation and by microbial degradation. Microbial oxidation of the oil is the main reason that the oceans and beaches of the world are not completely covered with petroleum hydrocarbons. Hydrocarbon oxidation has been observed in a wide variety of both terrestrial and marine microorganisms including many species of bacteria and several species of yeast and fungi. (Knapp-USGS) W74-12649

HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1972,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 7C. W74-12653

APPRAISAL OF OPERATING EFFICIENCY OF RECHARGE BASINS ON LONG ISLAND, NEW

YORK, IN 1969, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4B. W74-12655

WATER QUALITY CRITERIA 1972, A REPORT OF THE COMMITTEE ON WATER QUALITY CRITERIA.

National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Board.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 199, \$2.25 in microfiche. Environmental Protection Agency, Ecological Research Series, March 1972, 594 p., 3 append. EPA-R3-73.033.

Descriptors: *Water quality standards, *Reviews, *Regulation, *Baseline studies, Basic data collections, Recreation, Aesthetics, Water supply, Aquatic life, Wildlife, Irrigation water, Industrial water, Freshwater fish, Marine animals, Marine fish, *Toxicity, *Lethal limit, *Toxins, Bibliogra-

In 1971, at the request of the Environmental Protection Agency, the National Academy of Sciences-National Academy of Engineering undertook the revision of WATER QUALITY CRITERIA, the 1968 Report of the National Technical Advisory Committee (NTAC) to the Secretary of the Interior. The Academies appointed a Committee on Water Quality Criteria and six Panels, and the responsibility for overseeing their activities was assigned to the Environmental Studies Board, a joint body of the Academies. The guidelines for the Academies' Committee were-similar to those followed by the NTAC. The Committee's six Panels were: (1) Recreation and Aesthetics, (2) Public Water Supplies, (3) Freshwater Aquatic Life and Wildlife, (4) Marine Aquatic Life and Wildlife, (5) Agricultural Uses of Water, and (6) Industrial Water Supplies. In the 1972 Report many new subjects are discussed in detail, among them: the recreational impact of boating, levels of use, disease vectors, nuisance organisms, and aquatic vascular plants; viruses in relation to public water supplies; effects of total dissolved gases on aquatic life; guidelines for toxicological research on pesticides and uses of toxi-cants in fisheries management; disposal of solid wastes in the ocean; use of waste water for irrigation; and industrial water treatment processes and resultant wastes. Many toxic or potentially toxic substances not considered by the NTAC are discussed including polychlorinated biphenyls, phthalate esters, nitrilotriacetate (NTA), numerous metals, and chlorine. The six Sections do not provide summaries; an understanding of how the recommendations should be interpreted and used can be gained only by a thorough reading of the rationale and the evaluation of criteria preced-ing the recommendations. (See also W74-12675)

RESEARCH NEEDS IN WATER QUALITY CRITERIA, 1972. National Academy of Sciences-National Academy

of Engineering, Washington, D.C. Environmental Studies Board.

Available from Environmental Studies Board, National Academy of Sciences, 2101 Constitution AV, NW, Washington, DC 20418. NAS-NAE Report, Washington, DC, 1973. 64 p, 1 fig, 3 tab, 79

Descriptors: *Research priorities, *Water quality standards, *Reviews, *Regulation, *Baseline studies, Basic data collections, Recreation, dies, Basic data collections, Recreation, Aesthetics, Water supply, Aquatic life, Wildlife, Irrigation water, Industrial water, Freshwater fish, Marine animals, Marine fish, *Toxicity, *Lethal limit, *Toxins, Bibliographies.

In conjunction with the primary task of revising and updating Water Quality Criteria, the NAS-NAE Committee on Water Quality Criteria compiled research needs as limitations to establishing criteria were encountered because of a lack of scientific information. The present document re-ports on those needs and is intended to serve as a guide to scientists, research program managers, and institutions involved in fostering scientific in-formation relating to water quality requirements for the various uses made of the nation's waters Because the report is based largely on the Commit-tee's initial report, Water Quality Criteria, 1972, it should be used in conjunction with it, as the ra-tionale for most of the research needs reported here is found there. This report is crossreferenced by page numbers to appropriate sections of Water Quality Criteria, 1972. (See also W74-12674) Quality Cri W74-12675

HEALTH HAZARDS OF THE HUMAN EN-VIRONMENT.

For primary bibliographic entry see Field 5B. W74-12679

CONTROL OF CATCH-BASIN MOSQUITOES USING ZOECON ZR515 FORMULATED IN A SLOW RELEASE POLYMER: A PRELIMINARY

California Univ., Davis. Dept. of Entomology R. L. Dunn, and F. E. Strong. Mosq News. Vol 33, No 1, p 110-111. 1973.

Descriptors: *Mosquitoes, Polymers, Toxicity, *Pesticide toxicity.

Identifiers: Hormones, *Zoecon(ZR-515), Juvenile hormones, Catch-basin mosquitoes, Slow-

The potential effectiveness of a slow-release polymer-juvenile hormone (JH) system was demonstrated on a catch-basin study. The slowrelease polymers overcame a previously described problem a short residual toxicity. Now, catch basins treated early in the breeding season may result in effective control for the entire season with a single application of a JH-slow release polymer.--Copyright 1974, Biological Abstracts, W74-12691

EFFECT OF CORN STOVER ON PHOSPHORUS IN RUN-OFF FROM NONTILLED SOIL

Guelph Univ. (Ontario). Dept. of Land Resource

For primary bibliographic entry see Field 3F.

THE LACK OF INORGANIC REMOVAL OF DISSOLVED SILICA DURING RIVER-OCEAN

University of South Florida, St. Petersburg.

Marine Science Inst.
K. A. Fanning, and M. E. Q. Pilson.
Geochim Cosmochim Acta. Vol 37, No 11, p 2405-

Descriptors: *Rivers, *Estuaries, *Sediments, Oceans, Interfaces, *Saline water-freshwater interfaces, *Inorganic compounds, *Silica, Flumes, *Fluvial sediments, Suspended solids, *Sediment transport, Water pollution control. Identifiers: Orinoco, Venezuela, Savannah River,

Mississippi River, Plumes.

The significance of the inorganic removal of dissolved silica from estuarine zones was investigated at 3 river mouths: the Orinoco (Venezuela), the Savannah and the Mississippi, Particular attention was given to the Mississippi river plume, where extensive inorganic silica up-take had been reported. Mixing curves and laboratory dilution experiments provided little evidence that the phenomenon was widespread,. Because of an uncertain fresh water tie point, some inorganic uptake could not be completely ruled out for the Orinoco, but, in the plumes of the Savannah and Mississippi rivers, no inorganic silica removal was indicated. In contrast to published experiments on river sediments, laboratory dilution studies on suspended matter from the Mississippi river showed release of dissolved silica instead of uptake.--Copyright 1974, Biological Abstracts, Inc. W74-12724

EPIDEMIOLOGICAL ASPECTS OF THE PROBLEM OF SANITARY PROTECTION OF BODIES OF WATER, (IN RUSSIAN),

D. P. Nikitin Gig Sanit. Vol 37, No 12, p 61-63. 1972.

*Public *Diseases. Descriptors: health. Epidemiology, Environmental sanitation, Sanitary engineering, *Water supply, Infection, Protection.

Techniques Of Planning-Group 6A

A major role should be played by scientists and practical workers of the sanitary and epidemiological services in solving problems related with the use of funds allocated for environmental protection, particularly protection of bodies of water. In so doing they should concentrate on routine sanitary inspection. The successful implementation of measures to protect water will be a major contribution to the solution of the general problem of the prevention of intestinal infections in the country.—Copyright 1973, Biological Abstracts, Inc.

W74-12748

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

COMPUTER USES IN WATER SYSTEMS: CONFERENCE REPORT.

Water Research Association, Marlow (England). A Water Research Association Conference, University of Reading, England, 25-27 September 1973. 53 p, 15 fig, 6 ref, 1 append.

Descriptors: *Conferences, Computers, *Water resources development, *Information retrieval, *Water pollution control, *Data storage and retrieval.

The Water Research Association Conference of September 1973 dealt with the use of computers in the management, analysis, planning and design of water resource systems. A broad range of topics in both the water and computing fields were covered, and numerous data processing, simulation and optimization techniques were presented together with computer programs and models. Contained within this Conference Report are: STORET, the Environmental Protection Agency's computerized information system for defining cause and effect relations in water pollution; a summary of the discussions which took place during the Conference sessions, motivated by the invited Conference papers; the closing address; and an appendix comprised of the names and associations of the delegates attending the Conference. (See W74-12108 thru W74-12147) (Bell-Cornell)

STORET-THE EPA WATER QUALITY DATA SYSTEM.

Environmental Protection Agency, Washington, D.C.
C. S. Conger.

In: Computer Uses in Water Systems: Conference Report. A Water Research Association Conference, University of Reading, England, p 1-20, 25-27 September 1973. 15 fig.

Descriptors: Computers, *Information retrieval, *Water pollution control, *Data storage and retrieval.

STORET is the Environmental Protection Agency's computerized information system serving over two hundred remote locations. The system attempts to define the cause and effect relationships in water pollution. Described are the system and the form of the data identifiers. The system is based on two files: the water quality file and the General Point Source File. The methods of adressing the data base are outlined and examples of various retrievals are given. The paper concludes with a brief indication of proposed future developments. (See W74-12107) (Bell-Cornell) W74-12108

COMPUTER USES IN WATER SYSTEMS: CONFERENCE PAPERS.

Water Research Association, Marlow, (England).

A Water Research Association Conference, University of Reading, England, 25-27 September 1973. 308 p, 57 fig, 15 tab, 41 equ, 160 ref.

Descriptors: Computers, *Water resources, *Management, *Systems analysis, Data processing, Simulation analysis, Optimization, Computer models, Computer programs, Economics, Forecasting, Planning, Hydrology, River basins, Reservoirs, Lakes, Telemetry, Water treatment, Water quality control, Water supply, Water distribution(Applied), Mathematical models, Industries.

Identifiers: Regional water authorities, *United Kingdom.

This volume contains sixteen conference papers which deal with the use of computers in the management, planning, and analysis of water resource systems. These articles cover a broad range of topics in both the water and computing fields. Numerous simulation, optimization, and data processing techniques are presented. Included are such subjects as computer based management systems, management information in the water industry, computer and systems analysis applications to water resource planning, water quality monitoring, computer investigations of lake water movements, remote control of a water system using an on-line mini computer, computers in structural design, a process/financial computer modeling. These sixteen articles represent a comprehensive overview of the role being played by computers within the water industry, primarily in Great Britain. (See W74-12107) (Bell-Cornell) W74-12109

COMPUTER BASED MANAGEMENT SYSTEMS—OPPORTUNITIES IN THE NEW ORGANIZATION,

R. M. B. Kenyon.

In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 1-10, 25-27 September 1973.

Descriptors: *Organizations, Computers, *Management, *Benefits, Water resources, Planning, Methodology, Economics, Regional development, *Regional analysis.

Identifiers: *Regional Water Authorities, Data.

The formation of new, larger organizations presents numerous opportunities to obtain benefits from the use of computer based management systems. These systems will have an impact upon all aspects of the new organization, for example, in resource planning, quality control, distribution, and design, as well as providing scope for benefits in other areas such as administration. accounting, and financial planning. Considered is the introduction of computer based management systems in the new Regional Water Authorities. Discussed are the opportunities for benefits or improvements which are available and how new systems should be developed to achieve the goals and to avoid pitfalls and consequent disappoint-ments. Application of computer systems in specific areas is not dealt with here. Description is given of the main features of computer based management systems; this is then linked to the sections on opportunities by examining briefly the relevant aspects of the new authorities. Finally, the problems of development are discussed and a planning method is recommended. Successful changeover to computer based management systems necessitates hard work and careful planning, the main steps being: (1) audit present position and establish future needs; (2) simulate means of satisfying needs; and (3) prepare blueprint for implementation. (Seealso W74-12107) (Bell-Cornell) W74-12110

MANAGEMENT INFORMATION IN THE WATER INDUSTRY,

Sunderland and South Shields Water Co. (Ontario). For primary bibliographic entry see Field 4A. W74-12111

PROCESS/FINANCIAL MODELS,

J. N. Firth, and A. M. Sutton.

In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 29-39, September 1973. 3 fig.

Descriptors: *Mathematical models, *Computer models, Computer programs, Industries, Control, Planning, Economics, Evaluation, Estimating, Systems analysis.

Identifiers: *Financial models, Process evalua-

Identifiers: *Financial models, Process evaluation, Comprehensive modeling.

The concepts of mathematical model building are introduced and extended to include financial computer models. The general nature of these models and their use are investigated. Financial models are a sub-set of mathematical models, expressing relationships in monetary terms. Developed is a unique extension of financial models to include physical aspects, process yields, etc. In its most complex form a financial model is a complete control and planning system based on computer models. The four types of these are: those run in batch or time sharing, and those constructed using a financial language or a multi-purpose language such a FORTRAN. Two specific models, representing the extremes of financial model building, are discussed in detail. The first, a simple budget model built in a financial language, SIM-STRAT, calculates the gross profit and percentage increase in gross profit over the first period. The second is a generalized process model written in FORTRAN. This model, used extensively in London and Mexico, is designed to evaluate chemical and steel plants and other production systems. Considered are the possible applications of these techniques within the water industry. (See also W74-12007) (Bell-Cornell) W74-12112

AN INTEGRATED MODEL FOR THE PLANNING AND OPERATION OF WATER SYSTEMS.

Water Research Association, Marlow, (England). Economics Group. T. Wyatt.

In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, 25-27 September 1973, p 41-71. 29 p, 5 fig, 4 tab, 24 ref.

Descriptors: *Water resources development, *Planning, *Analytical techniques, *Multiple-purpose, *Operation and maintenance, Mathematical models, Costs, Resource allocation. Time, Water distribution(Applied), Networks, Design, Water storage, Water demand, Simulation analysis, Optimization, Systems analysis, Comprehensive planning, Regional analysis.

Analytical techniques have been developed in various problem areas of the water resources field. A brief review is made of three such areas: (1) water resource systems incorporating long-term storage for planning and operation, herein considering simulation and optimization techniques; (2) resource allocation to multiple demand areas, discussing allocation subject to short-term constraints and nonlinear power tariffs; and (3) water distribution systems, considering least-cost design of distribution networks. These are defined in terms of objectives, constraints, and the decision time span involved. The degree of interaction between these sub-areas is discussed and ways in which such dependence might be accomodated in light of present expertise are considered. In-

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creased regionalization, conjunctive and multi-purpose use promote this interaction between problem areas which must be modeled for global system optimization. Mathematical models should be developed within the overall framework of a total integrated water system model with due con-sideration of the financial links involved in the management process. (See also W74-12107) (Bell-Cornell)

SYSTEMS AND TECHNIQUES FOR RESOURCE

Water Resources Board, Reading (England).

V. K. Collinge.

In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, p 73-103, 25-27 September 1973. 7 fig, 8 ref.

Descriptors: *Water resources, *Regional analysis. *Analytical techniques. *Comprehensive sis, *Analytical techniques, *Comprehensive planning, Data processing, Hydrologic data, River flow, Resource allocation, Economics, Invest-ment, Timing, Simulation analysis, Groundwater, Multiple-purpose reservoirs, Control, Mathematical models, Systems analysis. Identifiers: England, National planning, Mixed in-

teger programming.

The development background of computer-based techniques to aid regional and national planning of water resources is outlined. Examined in detail are the main features of these types of analyses. The development of a system for processing and archiving river flow data is described. Planning techniques evolved by the Board are then described; future data needs and the tasks facing the new Data Collection Unit are indicated. Resource planning techniques and objectives, with respect to allocation and costing, are described and illustrated through reference to the Trent Economic Model. Description of the Model in-cludes that of the river, the allocation, and the timing of investment models, together with the way in which these models interact. Finally, examples of planning and operational models are given in three appendices. The first of these deals with a simulation technique for evaluation of a regional water resource system, the second with the South Downs groundwater model, and the third with short-term control strategy for multi-purpose reservoir systems. (See also W74-12107) (Bell-Corgall) W74-12114

SYSTEMS ANALYSIS IN WATER RESOURCE PLANNING IN THE USA, Geological Survey, Washington, D.C. Water

Resources Div.

E. D. Attanasi. In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Con-ference, University of Reading, p 105-127, September 1973. 2 tab, 61 ref.

*Water resources, nalysis, *Analytical Descriptors: *Planning. *Systems analysis, *Analytical techniques, *Surveys, Computers, Evaluation, Value, Com-prehensive planning, *United States, Optimiza-tion, Simulation analysis, Mathematical models, Economics, Hydrology, Forecasting.

A heuristically-based survey of computer and systems analysis applications to water resource planning is presented. Systems techniques are considered in terms of their application to the establishment of economic, social, physical and hydrologic relationships, to forecasting values of planning variables, and to evaluating, via simulation or optimization, alternative policies in terms of system performance. Specific techniques are reviewed briefly. A general appraisal of methods of construction and 'validation' of systems models is made. Presented is a tabular survey of special applications of computer modeling and optimization techniques; selected hydrologic, physical, economic and social modeling efforts and alternative optimization and decision models are reviewed. An assessment is made of the impact of computer and systems analysis applications to water resource planning. A summary of previous criticism is also presented. The concluding discussion suggests how these methodological issues may dictate the direction of future research. (See W74-12107) (Bell-Cornell) W74-12115

FORECASTING POLLUTION IN RIVERS, ESTUARIES AND THE SEA,

Water Pollution Research Lab., Stevenage (England).

For primary bibliographic entry see Field 5B. W74-12116

ASPECTS OF MONITORING AND CONTROL OF WATER QUALITY, Great Ouse River Authority (England).

For primary bibliographic entry see Field 5A. W74-12117

COMPUTER INVESTIGATIONS OF WATER MOVEMENTS IN LAKES.

For primary bibliographic entry see Field 2H. W74-12118

STUDY RELATING TO THE USE OF A PROCESS CONTROL COMPUTER FOR A WATER TREATMENT PLANT IN FRANCE, Compagnie Generale des Eaux, Paris (France). For primary bibliographic entry see Field 5F.

COMPUTER USE IN US WATER AUTHORITY, Chicago Dept. of Water and Sewers, Ill. For primary bibliographic entry see Field 5F. W74-12120

REMOTE CONTROL OF A WATER SYSTEM USING AN ON-LINE MINI COMPUTER, East Worcestershire Waterworks Co. (England). For primary bibliographic entry see Field 7C.

AN INTRODUCTION TO COMPUTER INFOR-MATION SYSTEMS IN DISTRIBUTION, For primary bibliographic entry see Field 4A. W74-12122

COMPUTERS IN STRUCTURAL DESIGN. Constructional Industry Research and Information Association, London (England). For primary bibliographic entry see Field 8A. W74-12123

USE OF COMPUTERS BY THE CONSULTING ENGINEER IN THE DEVELOPMENT OF WATER RESOURCES,

W. Pemberton.

M. Peinterton. In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Con-ference, University of Reading, England, p 283-294, 25-27 September 1973. 1 ref. 2 append.

*Water resources development, *Environmental engineering, Computers, *Environmental engineering, *Computer programs, *Hydrologic data, Benefits, Planning, Data processing, Hydraulics, Simulation analysis.

Discussed is the use of computers by consulting engineers in the water resources field; considered is the effect of this use upon their organization and management systems. The obvious and secondary benefits of computer use are mentioned. The use of computers to rationalize documentation and in the digital simulation of water resource systems is discussed. The possible future development of GENESYS sub-systems to cover water resources problems is considered; an outline of a possible, simple sub-system for processing hydrological data is given. (See also W74-12107) (Bell-Cornell) W74-12124

RECENT DEVELOPMENTS IN COMPUTING SYSTEMS AND REMOTE TERMINALS P. F. Windley.

P. F. windiey.
In: Computer Uses in Water Systems: Conference
Papers, A Water Research Association Conference, University of Reading, England, p 295-308, 25-27 September 1973.

Descriptors: Computers, *Water resources, Industries, "Control, "Data transmission, "Data processing, Operation and maintenance, Benefits, Planning, Management, Communication.

Identifiers: Information, Regional Water Authorities(England), Bureaus.

Until a short while ago, the characteristics of computers were restrictive in applications to water problems; particular difficulties were experienced with delays in communicating with the computers. Recent developments however, especially in data transmission, have removed many of these difficulties and now enable the economic provision of computing services and of computer-based infor-mation services to dispersed organizations, such as the new Regional Water Authorities (RWA's). This paper discusses how current developments in computing services can help serve the re-organizing water industry in England. Considered are mini-computers, terminals, the commercial scene, databases and database management systems, software packages, technical systems, and com-puter selection. The author envisages the day when each RWA will have a centralized large computer on which will be based not only the 'classic' computer applications of accounting, payroll and project control, but also information services for strategic planning and day-to-day control and technical services for engineers and planners. (See also W74-12107) (Bell-Cornell) W74-12125

COMPUTER USES IN WATER SYSTEMS: CON-TRIBUTED PAPERS.

Water Research Association, Marlow (England). A Water Research Association Conference, University of Reading, England, 25-27 September 1973. 110 p, 38 fig, 3 tab, 29 equ, 27 ref.

Descriptors: Computers, *Water resources development, *Systems analysis, Management, Simulation analysis, Optimization, *Computer programs, *Computer models, Data processing, Planning, Design, Hydrology, Water pollution control, Water distribution(Applied), Networks, Reservoirs, Rivers, Lake Erie, Economics, Water chemistry, Finite element analysis, Dynamic pro-

gramming. Identifiers: River authorities, *United Kingdom.

This is a supplement to the volume which contains invited Water Research Association Conference papers. Comprised herein, however, are 22 short articles which were contributed to the Conference. They deal with the use of computers in the management, analysis, planning and design of water resource systems and cover a broad range of topics in both the water and computing fields. Numerous data processing, simulation and optimiza-tion techniques are presented together with computer programs and models. Included is the use of computers in such areas as integrated hydrometric data processing by a river authority, public health engineering, reservoir scheme yield assessment, river regulation scheme design, time-sharing for water resources planning, wind driven circulation in shallow lakes, prediction of ammoniacal nitrogen, analysis and design of water distribution

WATER RESOURCES PLANNING—Field 6

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systems, the start-up model of a rapid sand filter. and the development of a national library of GENESYS programs. These 22 articles represent a comprehensive overview of the role being played by computers within the water industry, primarily in Great Britain, and are a rich supplement to the volume containing invited Conference papers. (See also W74-12107) (Bell-Cornell) W74-12126

A CASE STUDY OF THE SUSSEX/KENT RIVER AUTHORITIES' INTEGRATED HYDROMET-RIC DATA PROCESSING SYSTEM, Sussex River Authority (England).

For primary bibliographic entry see Field 7C. W74-12127

TECHNICAL COMPUTER SYSTEMS,

Mersey and Weaver River Authority (England). D. Sherlock, and E. Tongue.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 5-9, 25-27 September 1973.

Descriptors: Computers, Analysis, *River basin commissions, Hydrometry, Management, Reservoirs, Conjunctive use, Rainfall, Computer programs, Backwater, Curves, Frequency analysis, Information retrieval.

Identifiers: Technical problems, Conveyance curves, Information,
*United Kingdom. Abstraction licenses,

Discussed is the development of the application of computer systems to technical problems by the Mersey and Weaver River Authority. Following the Authority's inception, the basic information relating to abstraction licenses was put on computer file. The range of analyses of hydrometric data was extended and programs were developed for use in hydraulic design calculations. An ICL 1901A computer comprises the central processor; magnetic tapes have recently been added. The range of technical applications in use at present is outlined, including: backwater and conveyance curves; surveying; river flow analysis; rainfall analysis; frequency analysis; state-discharge calculations: experimental catchment: reservoir and conjunctive-use programs; and abstraction licence analyses. The last two applications are discussed in more detail. Described is a minimum ranking program developed for use either in reservoir design or in conjunctive use schemes; the program calculates from main daily flows and limitations on abstractions, such as prescribed flows, etc., the quantity of water which may be abstracted during each day. The licence file has been expanded and is designed to contain information required for a variety of purposes by different departments of the Authority. It is now a management system rather than a simple technical application. (See also W74-12107) (Bell-Cornell)

COMPUTER SERVICES AND APPLICATION IN THE GREATER LONDON COUNCIL'S DE-PARTMENT OF PUBLIC HEALTH ENGINEER-

Greater London Council (England). Dept. of Public Health Engineering. For primary bibliographic entry see Field 5G.

W74-12129

PROPOSED KIELDER WATER RESERVOIR SCHEME COMPUTER APPLICATION IN YIELD ASSESSMENT, Northumbrian River Authority (England).

For primary bibliographic entry see Field 4A. W74-12130

GENERAL ENGINEERING COMPUTER USE AT THE WELLAND AND NENE RIVER AT THE WELLAND AND NENE RI AUTHORITY, Welland and Nene River Authority (England).

For primary bibliographic entry see Field 4A. W74-12131

THE DESIGN OF A TWO-RESERVOIR RIVER REGULATING SCHEME, South Staffordshire Waterworks Co. (England).

For primary bibliographic entry see Field 4A. W74-12132

THE USE OF A COMMERCIAL TIME-SHARING COMPUTER FOR WATER RESOURCE PLANNING.

Severn River Authority (England).

T. Kitson.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 35-38, 25-27 September 1973. 1 fig.

Descriptors: Computers, *Data processing, *Water resources, *Planning, Computer models, *Computer programs, Data collections, Projects, Reservoir operation, Simulation analysis, River regulation, River flow, Costs, Systems analysis. Identifiers: Time-sharing computers, Batch facili-ties, Commercial bureaus, Predicting.

This brief paper describes the use by the Servern River Authority of a commercial bureau which offers batch, time-sharing, and remote job entry facilities. A number of sub-systems are used to insure mixed mode operation of the three facilities. Two examples of the type of water resource planning projects undertaken are discussed: reservoir simulation studies and river regulation studies. The costs of using the facilities are con-sidered. It is concluded that a commercial bureau provides planners with a sophisticated computer installation which is almost continuously available without the commitment to expensive equipment, specialist personnel or office equipment. (See also W74-12107) (Bell-Cornell) W74-12133

WATER RESOURCE DEVELOPMENT

Cornwall River Authority, Launcestor (England). For primary bibliographic entry see Field 4A. W74-12134

A GENERAL PURPOSE DIGITAL MODEL OF A WATER RESOURCE SYSTEM.

Leicester Univ. (England). Dept. of Engineering.

A. C. Tory.
In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 52-55, 25-27 September 1973. 5 fig.

Descriptors: *Computer models, *Computer programs, *Digital computers, *Water resources, Hydrologic data, Engineering, Systems anslysis. Identifiers: Model building, Operating rules.

A computer package, designed to enable the water resources engineer to produce a reliable model with the minimum of programming effort, is described. In constructing a model, the physical system must be expressed operationally; a system diagram and a data file are shown. The heart of the model is contained within the function FLOW; the sources of hydrological data are specified within the function HYDRO. Limitations and future developments of the package are discussed. (See also W74-12107) (Bell-Cornell) W74-12135

THE APPLICATION OF A SIMULATION MODEL TO THE PLANNING AND MANAGE-

MENT OF WATER RESOURCES IN LAN-CASHIRE

Lancashire River Authority (England). For primary bibliographic entry see Field 4B. W74-12136

COMPUTER ASSISTED QUANTITATIVE SPEC-TROGRAPHIC ANALYSIS,
Water Research Association, Marlow (England).

For primary bibliographic entry see Field 5A. W74-12137

WIND DRIVEN CIRCULATION IN SHALLOW LAKES: A FINITE ELEMENT APPROACH, Water Research Association, Marlow (England). For primary bibliographic entry see Field 2H.

COMPUTER APPLICATIONS IN WATER QUALITY MODELLING: PREDICTION OF AM-MONIACAL NITROGEN IN THE RIVER

THAMES, EASAMS, Camberley (England).

For primary bibliographic entry see Field 5B. W74-12139

COMPUTER AIDED ECONOMIC DESIGN OF WATER DISTRIBUTION SYSTEM,

University Coll., London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B. W74-12140

THE COMPUTER SIMULATION OF THE OPERATION OF A BANK OF RAPID GRAVITY FILTERS,

Water Research Association, Marlow (England). For primary bibliographic entry see Field 5D. W74-12141

COMPUTER ORIENTED APPROACH OF A WATER DISTRIBUTION SYSTEM, National Inst. of Scientific Research, Quebec.

For primary bibliographic entry see Field 4A. W74-12142

AN INVESTIGATION OF THE OPTIONAL ON-LINE CONTROL OF A WATER SUPPLY NET-

Cambridge Univ. (England). Engineering Lab. For primary bibliographic entry see Field 4A. W74-12143

LAY-OUT AND DIAMETER OPTIMIZATION FOR A LOOPED WATER TRANSPORTATION

NETWORK,
Municipal Water Works of Rotterdam For primary bibliographic entry see Field 4A. W74-12144

ANALOGUE AND HYBRID METHODS FOR THE ANALYSIS AND PLANNING OF WATER DISTRIBUTION NETWORKS, Ring-Belt Ltd. (West Germany); and Montan-

Forschung (West Germany). For primary bibliographic entry see Field 4A. W74-12145

THE START-UP MODEL OF A RAPID SAND

Philips Forschungslaboratorium G.m.b.H., Hamburg (West Germany). For primary bibliographic entry see Field 5F. W74-12146

Group 6A—Techniques Of Planning

DEVELOPING A NATIONAL LIBRARY OF PROGRAMS USING GENESYS, Loughborough Univ. of Technology (England).

Genesys Centre. R I Allwood

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 105-110, 25-27 September 1973. 1 fig, 2 ref.

Descriptors: Computers, *Computer programs, Engineering, *Libraries.

In the utilization of computers for engineering, the similar problems which must be faced by both programmers and users are discussed. For example, many programs will work only on the computer used for the initial development, and often can be understood of used only by the original author. This is tolerable with small programs; but with progress in electronics, more sophisticated and larger programs are being developed. It then follows to ask whether the programming tools of the 60's are suitable for developing such complex, substantial programs. The creation of GENESYS and the establishment of the Genesys Centre provide solutions to these problems. The advantages of this program and Centre for both user and pro-grammer are discussed in detail. GENESYS uses a machine-independent language which is easily translatable into a version of FORTRAN suitable for the particular computer being used. The library of engineering programs needs only to be written once and is available on many types and sizes of computer, at many computing centres throughout the country. The Genesys Centre acts as the focal point for the development and supply of programs. To promote use of GENESYS, the Centre: (1) maintains and distributes programs; (2) provides publicity and education; and (3) develops a library. GENESYS is a commercial venture. (See also W74-12107) (Bell-Cornell) W74-12147

UPPER WABASH SIMULATION MODEL. PRO-GRAM DOCUMENTATION AND EXTENSION, Purdue Univ., Lafayette, Ind. Water Resources Research Center

For primary bibliographic entry see Field 4A. W74-12197

WEBER RIVER BASIN INCLUDING DAVIS COUNTY AND THE OGDEN S.M.S.A.: WATER QUALITY MANAGEMENT PLANNING, PHASE I--PROGRAM DESIGN.

Stevens, Thompson and Runyan, Inc., Portland, Oreg. and Nielsen, Maxwell and Wangsgard, Inc., Salt Lake City, Utah.

Utah State Division of Health, Salt Lake City, February 1973. 57 p, 4 fig, 3 tab.

Descriptors: *Planning, *Regional analysis, *River basin development, *Utah, *Watershed manage-ment, *Water quality control, River basins, Water Quality Act, Federal Water Pollution Control Act, Cities, Long-term planning, Project planning, Stu-

*Weber River Basin, Area-wide Identifiers: planning, Metropolitan planning.

A program design is presented for water quality planning in the entire Weber River Basin, including both metropolitan areas and non-metropolitan on metropolitan areas and non-metropolitan areas within Weber County and Davis County, Utah. The metropolitan areas includes portions of the Ogden and Salt Lake City Standard Metropolitan Statistical Areas. This first phase study is an attempt to define the program clearly. Phase I consists of the following elements: physical descriptions. cal description of the planning area, goals and objectives, statement of problem, status of basin planning, and a description of the water quality planning program. The latter is subdivided into program management, program design, planning coordination, funding and budget. Brief descrip-tions of individual tasks comprising the planning

program are provided in the Program Design section. A task numbering system has been adopted to follow the logic of the planning process. The nine major tasks suggested are: (1) program definition and design, (2) program management, (3) community involvement and information, (4) data system, (5) system requirements, (6) synthesis of alternative systems, (7) analysis of alternative systems, (8) evaluation of alternative systems and selection of a preferred system, and (9) implementation plan. Phase II of the program will provide budget cost estimates and recommendations for finalizing of funding and assignments of tasks. Phase III will be development of the water quality management plan for the Weber River Basin. Phase IV will be development of the metropolitan water quality management plans for the Ogden SMSA and Davis County. (Poertner) W74-12238

LEGAL PROBLEMS IN WATER POLLUTION CONTROL

New York State Dept. of Environmental Conservation, Albany.

For primary bibliographic entry see Field 6E. W74-12239

CHATTANOOGA AREA REGIONAL COUNCIL OF GOVERNMENTS COMPREHENSIVE WATER AND SEWER STUDY: HAMILTON, WALKER AND CATOOSA COUNTIES, BOOK TWO.

Hensley-Schmidt, Inc., Chattanooga, Tenn. Chattanooga Area Regional Council of Governments, Chattanooga, Tennessee, December 1971. 192 p, 39 fig, 9 tab. Tennessee P-131.

Descriptors: *Planning, *Water supply development, *Sewerage, *Regional analysis, *Georgia, *Tennessee, Waste water treatment, Long-term planning, Municipal water, Municipal wastes, Urbanization, Comprehensive planning. Identifiers: *Chattanooga(Tennessee).

A comprehensive regional water supply and sewerage plan was developed for a three-county area surrounding Chattanoga, Tennessee. The study area included Walker and Catoosa Counties in Georgia and Hamilton County, Tennessee. Efforts to expand opportunities and solve problems within the region are underway through a comprehensive planning program which includes regional studies of housing, land use, transportation, parks, recreation, open space, solid waste disposal, water and sewerage. In recent years, many local governments have initiated independent studies and developmental programs to meet the water and sewerage needs of their citizens However, to date no study has been made of the entire area with a view toward coordinating and meeting both present and future needs. Because water and sewerage systems are closely related to the topographic features of an area, rather than political boundaries, it is important to consider providing these services on a regional basis if the most beneficial and compatible land use and water resources conservation are to be attained. Based on findings, specific recommendations deal with the development of a comprehensive plan for water and sewerage facilities for the three-county area. (Poertner) W74-12242

MULTILEVEL OPTIMIZATION FOR CON-JUNCTIVE USE OF GROUNDWATER AND SURFACE WATER,

Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center. For primary bibliographic entry see Field 4B. W74-12296

PLANNING AND HUMAN VALUES - AN INQUIRY INTO THE PHENOMENON OF URBAN GROWTH AND THE POSSIBILITY OF

ITS CONTROL THROUGH WATER AND LAND

RELATED ACTIONS, Abt Associates, Inc., Cambridge, Mass For primary bibliographic entry see Field 6B.

CAPACITY OF WATER-BASED RECREATION

SYSTEMS PART II: A SYSTEMS APPROACH TO CAPACITY ANALYSIS, North Carolina State Univ., Raleigh. Dept. of Recreation Resources Administration. For primary bibliographic entry see Field 6B. W74-12364

6B. Evaluation Process

INTERREGIONAL IMPACTS OF ALTERNATIVE WATER POLICIES FOR IRRIGATION IN WESTERN UNITED STATES,

Wisconsin Univ., Madison. Dept. of Agricultural Economics., and Wisconsin Univ., Madison. Dept.

For primary bibliographic entry see Field 3F. W74-12002

EFFLUENT MANAGEMENT INFORMATION SYSTEM (EMIS),
Development Sciences, Inc., East Sandwich,

For primary bibliographic entry see Field 5G. W74-12082

AN INTEGRATED MODEL FOR THE PLANNING AND OPERATION OF WATER SYSTEMS,

Water Research Association, Marlow, (England). Economics Group.
For primary bibliographic entry see Field 6A.

SYSTEMS ANALYSIS IN WATER RESOURCE PLANNING IN THE USA, Geological Survey, Washington, D.C. Water

Resources Div. For primary bibliographic entry see Field 6A.

A Q-METHODOLOGICAL STUDY OF AT-TITUDES TOWARD WATER RESOURCES AND IMPLICATIONS FOR USING MASS MEDIA IN DISSEMINATION OF WATER RESEARCH

RESULTS, Missouri Univ., Columbia. Water Resources Missouri Univ., Columb Research Center. R. R. Kahle, and R. L. Lee.

Available from the National Technical Informa-tion Service as PB-235 859 \$8.00 in paper copy, \$2.25 in microfiche. Partial Completion Report, (1974). 349p, 5 fig, 23 tab, 160 ref, 8 append. OWRT X-127(3756)(1).

Descriptors: *Attitudes, *Communication, *Information exchange, *Social aspects, *Public opinion, *Publications, Psychological aspects, Motivation, Human behavior, Rural sociology. Social sciences, Questionnaires, Applied Social sciences, Questionnaires, Applied psychology, Public relations, Behavior, Social Applied behavior, Editing, Reviews, *Missouri, Films, Correlation analysis. Television,

Identifiers: *Q-Methodology study, Newspapers, *Mass commu communication. *Dissemination of information, *Factor analysis, Religion, Abduction, Depth interviews, Beliefs, Extension service, News media, Attitude scaling,

To analyze audience attitudes, a Q-study of attitudes toward water resources in Missouri was undertaken. Four basic attitude types were iso-lated: 'Ecologically Aware,' 'Farmers' Ad-vocates,' 'Rural Optimists,' and 'Optimistic Professionals.' The study further showed how this attitude information could be applied to designing a dissemination of information program utilizing the mass media, with special attention to radio and newspapers. Among the demographic variables that were found most pertinent to water resources attitude patterns were relious affiliation, age, and residence (urban, town, or rural). A replication of Costantini and Hanf's Environmental Awareness Scale failed to be internally reliable when transplanted to Missouri. However, the four basic at-titude patterns closely resemble the four lemma clusters described by Courtland Smith in an Oregon study. W74-12192

ESTIMATING RESERVOIR RECREATIONAL VISTS IN INDIANA, Purdue Univ., Lafayette, Ind. Water Resources Research Center. K. K. Wolka, and G. H. Toebes.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 818, \$4.50 in paper copy, \$2.25 in microfiche. Technical Progress Report No 48, June 1974, 99 p, 8 tab, 24 fig, 21 ref, 5 append. OWRT-A-026-IND(3).

Descriptors: *Recreation, *Access routes, *Lakes, *Multiple purpose projects, *Reservoir operations, Water sports, Swimming, Boating, Recreation demand, Reservoirs, Transportation, Statistical models, Correlation analysis, *Indiana,

*Estimating.
Identifiers: *Population centers, *Origin-Destination models, Recreation Standard models, Network models, Forecasting models, Causal models.

A prediction model was developed to estimate the expected number of recreational vists to Federal reservoirs in Indiana. To this end an elementary origin-destination model was amended in several ways. The ultimate purpose in constructing the simulation model was its possible use for evalua-tion purposes of benefits from different types of water resources development. The two main pro-iect benefits are flood control and recreation. An evaluation of the recreation benefits requires an estimate of the expected future visitation based on Indiana data. This estimation method is the subject of the report. The method is an improvement over existing models in that a network approach was followed. Further work is needed to adjust the model. The absence of some constraints for the selection of which data are not yet available, caused several unacceptable prediction results. (See also W74-12197) W74-12196

AN INVESTIGATION OF FACTORS AFFECT-ING THE RECREATIONAL USE OF STATE

Maryland Univ., College Park. Water Resources

Research Center. J. Volk, and A. O'Neill

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 819, \$4.00 in paper copy, \$2.25 in microfiche. Technical Report 27, (1974). 81 p, 6 tab, append. OWRT A-008-MD(1), 14-01-0001-790.

Descriptors: *Recreation, *Recreation demand, *State parks, *Recreation facilities, Planning, Attitudes, Social aspects.

The distance of a recreation facility from potential users does exert an important influence on the in-tensity of use which a facility receives. The exact nature of this influence varies somewhat depending on the nature of the creation area, but is in all cases the dominant influence. With no information other than the distance of recreation area from blocks of potential users, a fairly reliable estimate of the relative intensity of use can be derived. Some information concerning the type and quality of the recreation area under consideration is necessary if these attendance-distance relationships are to be used for predictive purposes. snips are to be used for predictive purposes. Further studies with different types of recreation areas should help define more precisely dif-ferences in the attendance-distance relationship with differing kinds of recreation are as. Quality and uniqueness of the recreation area are important factors to consider when looking at the attendance-distance relationship. It is desireable to locate many types of recreation facilities where they will be accessible to large numbers of people. Most large metropolitan areas are in need of more easily accessible recreation. Recreation planners and other resource planners must keep in mind the importance of accessibility when considering resource investments which have recreational potential. If accessibility is not given major attention in the planning process, the result will be a smaller return on resource investments than would otherwise be possible. W74-12198

ECONOMIC EFFECTS OF SUBSIDIES FOR WASTE ABATEMENT,

Clemson Univ., S.C. Dept. of Economics For primary bibliographic entry see Field 5G. W74-12199

MULTIPURPOSE WATER RELATED DEVELOPMENT IN URBAN AREAS, California Univ., Berkeley. Hydraulics Lab. For primary bibliographic entry see Field 4A. W74-12226

WATERSHED VALUES IMPORTANT IN

FORST SERVICE (USDA), Franklin, N.C. Southeastern Forest Experiment Station.
For primary bibliographic entry see Field 4D.
W74-12230

WATER SUPPLY AND WATER POLLUTION CONTROL CAPITAL PROGRAM 1972-1985.
Delaware Valley Regional Planning Commission, Philadelphia, Pa. For primary bibliographic entry see Field 6E. W74-12233

PERCEPTION OF WATER QUALITY BY SELECT RESPONDENT GROUPINGS IN INLAND WATER-BASED RECREATIONAL ENVIRONMENTS,

Rensselaer Polytechnic Inst., Troy, N.Y. Freshwater Inst. For primary bibliographic entry see Field 5G. W74-12287

SOME EVIDENCE OF ECONOMICS OF SCALE HAWAIIAN SUGAR PLANTATION,
Hawaii Univ., Honolulu. Water Resources

Research Center. For primary bibliographic entry see Field 3F. W74-12344

WATER RESOURCES PROTECTION MEA-SURES IN LAND DEVELOPMENT - A HAND-

Delaware Univ., Newark. Water Resources Center. For primary bibliographic entry see Field 5G. W74-12352

SOCIO-ECONOMIC IMPACT OF ESTUARINE

THERMAL POLLUTION, MetroStudy Corp., Washington, D.C. For primary bibliographic entry see Field 5C. W74-12353

PLANNING AND HUMAN VALUES - INQUIRY INTO THE PHENOMENON

URBAN GROWTH AND THE POSSIBILITY OF ITS CONTROL THROUGH WATER AND LAND RELATED ACTIONS.

Abt Associates, Inc., Cambridge, Mass. O. A. Salama.

Available from the National Technical Informa-\$\text{ston Service, Springfield, Va 22161 as PB-236 035, \$5.75 in paper copy, \$2.25 in microfiche. Completion Report, April 1974. 219 p, 3 append. OWRT C-4161(No. 9026)(1).

Descriptors: *Methodology, *Decision making, *Social aspects, *Social impacts, *Social values, *Comprehensive planning, Land use, Zoning, At-titudes, Urbanization, Evaluation, Water policy. Identifiers: Urban growth, Resistance to urban growth, Community goals, Latent shortage.

Three instruments were designed and implemented to measure the effectiveness of water as a resource to control urban growth. The instruments were applied in varying degrees to forty urban communities whose water supply was unable or has been exactly able to keep up with the demand for water. The data was then used as an input for the development of a procedure for multiple objectives planning, which has utility in the evaluation of any specific water development project in-volving opposing attitudes toward growth in the affected urban communities. W74-12354

PRIMARY DATA ON ECONOMIC ACTIVITY AND WATER USE IN PROTOTYPE OIL SHALE DEVELOPMENT AREAS OF COLORADO: AN INITIAL INQUIRY,

Colorado State Univ., Fort Collins. Dept. of Economics. S. L. Gray.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 039, \$3.00 in paper copy, \$2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report No 58, June 1974. 8 p. OWRT A-024-COLO(1). 14-01-0001-4006.

Descriptors: *Colorado, *Water utilization, Oil shales, Economics, *Community development, *Economic prediction, *Income distribution.

Identifiers: *Oil shale development, Economic structure.

Potential impacts of oil shale development on the economies of certain Western Slope communities in Colorado are quite large. These impacts will likely exert a substantial pressure on the land and water resource lease of the area in addition to the effects upon community development, regional income, income distribution, and a changing mix of business activity. In order to approach future research on these issues this 'seed' research effort was designed to (1) promote interaction and interchange of ideas among researchers and members of the affected communities, (2) to identify important areas of research needs in the oil shale region, and (3) to initialize the collection of primary data depicting the economic structure of the oil shale communities. W74-12356

METHODS FOR TRANSFERRING WATER RESOURCES RESEARCH FINDINGS TO PRAC-TICING ENGINEERS, North Carolina Univ., Chapel Hill. Dept. of En-

vironmental Sciences and Engineering. For primary bibliographic entry see Field 10D. W74-12363

CAPACITY OF WATER-BASED RECREATION TO CAPACITY ANALYSIS,
North Carolina State Univ., Raleigh. Dept. of

Recreation Resources Administration.
G. A. Hammon, H. K. Cordell, L. W. Moncrief,
M. R. Warren, and R. A. Crysdale.

Group 6B—Evaluation Process

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 069, \$3.25 in paper copy, \$2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Completion Report, (UNC-WRRI-74-90) Report No. 90, July, 1974. 46 p, 6 fig, 1 tab. OWRT B-013-NC(4). 14-01-0001-1936.

Descriptors: Recreation, Boating, Skiiing, Fishing, *Systems analysis, Recreation facilities, Lakes, Model studies, Simulation analysis, *Recreation demand, *North Carolina, Attitudes. *Burlington Reservoir(NC), *Recreation capacity.

This is the second in a series of reports designed to develop methods, models and guidelines useful to lake managers as they seek to measure or predict capacity as a step toward optimiziang the recreational output of lake systems. This report applies systems concepts are applied to the problem of analyzing the capacity of water-based recreation systems. The conceptual framework of a simulation model and a number of explanatory models representing boating behavior are presented. (See also W74-07719), (Gordon A. Hammon, Harold K. Cordell, et al, 'Capacity of Water-Based Recreation Systems, Part I - The State of the Art,' April W74-12364

SOCIAL DIMENSIONS OF URBAN FLOOD CONTROL DECISIONS,

Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources For primary bibliographic entry see Field 6F. W74-12369

DETERMINATION ON NEVADA'S ATTITUDE TOWARD WATER RESOURCES RESEARCH. Nevada Univ., Reno. Desert Research Inst. R. M. Whitacre.

Completion Report, August 1974, 5 p. OWRT A-041-NEV(1). 14-31-0001-3228.

Descriptors: *Attitudes, *Information exchange, *Communication, *Research priorities, *Project planning, *Nevada.

Identifiers: Information dissemination, Research results, Advisory groups, Research planning.

One of the major problems confronting a research center is the dissemination of information to the people of the area as to how the research results can be of value to the community. The primary ob-jective of this particular study was to identify needs and priorities of water resources research in Nevada, to recommend programs and guidelines to meet those needs and the ultimate dissemination of these findings by the Center for Water Resources Research, Reno, Nevada. It was found that a concerted effort must be made to determine the local research needs and the delivery of the research results. Also, that all information should be prepared both for technical use and use by the avefage citizen. Finally, a statewide group of interested organizations and officials should be formed to advise the Center as to the water resouce needs and problems in Nevada. (Fallon-Nevada) W74-12371

MANAGEMENT FOR THE FUTURE, Council on Environmental Quality, Washington, For primary bibliographic entry see Field 6G. W74-12459

THE ECONOMICS OF ECOLOGY, Colorado Univ., Boulder. For primary bibliographic entry see Field 6G. INCREMENTALISM AND ENVIRONMENTAL-

ISM, Yale Univ., New Haven, Conn. For primary bibliographic entry see Field 6G. W74-12463

REGIONAL ENVIRONMENTAL MANAGE-MENT AND THE DECISION MAKING PROCESSOR SAID DIES CO.

San Diego County, Integrated Regional Environ-mental Management Project, Calif. For primary bibliographic entry see Field 6G. W74-12466

A DESCRIPTION OF THE ENVIRONMENTAL PLANNING AND MANAGEMENT PROJECT. Metropolitan Government of Nashville Davidson

County, Tenn For primary bibliographic entry see Field 6G.

THE CONCEPT OF CARRYING CAPACITY, Utah State Univ., Logan. Dept. of Civil and En-

vironmental Engineering. A. B. Bishop, R. Toth, A. B. Crawford, and H. H. Fullerton.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. V:24-V:37. 1974. 3 fig, 2 ref.

Descriptors: *Carrying capacity, *Environmental control, *Environmental effects, *Resources, *Resources development, Resource allocation, Costs, Economics, Social aspects, Regional development, Spatial distribution, Urbanization, Constraints, Limiting factors, Benefits, Costs. Identifiers: Regional growth, Urban regions, Growth limitations.

Carrying capacity is the level of a certain activity that can be sustained in a given environment. Recent rapid rise of concern for environmental problems has revealed that levels of particular activities (e.g. automobile transportation, sewage disposal) in many urban areas have already exceeded carrying capacities with dire results. The concept of carrying capacity must be included in planning regional development. Determinants of carrying must be considered. First, resources of the environment should be cataloged: ambient resources (airsheds, watersheds, sunlight); spatial resources (underground, surface and air); infrastructure and distributive resources (utilities, transportation); ecological resources (plants, animals); sociocultural resources; economic resources (labor, capital, raw materials); and amenity resources (seashores, open space). The desired information about each resource should include the quality and quantity, renewability, spatial distribution, and economic and social costs. Linkages between the urban environment and the region, e.g. linkages of transportation and water and energy distribution, are the second determinant, and life styles and social values of the individuals and institutions, the third. Application of carrying capacity must consider both the stability and resiliency of the system as it moves toward the equilibrium state, the factor which limits resource use or growth, and the factor which might trigger an unplanned and undesired chain of events in the ecological or urban system. (See also W74-12457) (LaPointe-North Carolina) W74-12469

FIXED VERSUS VARIABLE ENVIRONMENTAL STANDARDS,

MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 6G. W74-12470

THE STRATEGIC ENVIRONMENTAL ASSESS-MENT SYSTEM (SEAS): A RESEARCH PRO-Environmental Protection Agency, Washington,

S. M. Greenfield.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. VI:26-VI:31 1974

Descriptors: *Assessments, *Computer models, *Cost-benefit analysis, Environmental effects, Decision making, Optimization, Pollution effects, Planning, Long term planning, Regional analysis, Research and development, Analytical techniques. Identifiers: Strategic Environmental Assessment System(SEAS).

Predicting long range environmental effects of different societal options is one of the most important challenges facing the environmental field. Benefits from such forecasting include a systematic or-ganization of the many criteria, social, economic, and environmental, that determine the effectiveness of different environmental strategies. Another benefit is the assistance that could be given to environmental managers in providing comprehensiveness, and following the progress of certain programs in achieving stated goals. Mid-course correction could be applied more easily by testing a set of alternative goal policies. The Strategic Environmental Assessment System model will have these important and new characteristics: (1) deal explicitly with pollution genera-tors, possible controls, and known effects of residuals; (2) be a national level model system; (3) have a 10 to 20 year time horizon; (4) make use of official environmental, economic and demo-graphic data; (5) be used together with expert opinion; and (6) project the state of the environ-ment and socioeconomic systems. A text model of the system will be completed in December and will be used to prepare a '1980 State of the Environment' projection. Initially SEAS will be used to assess different policy options, integrating the computer's capabilities and human expert opinion, and to establish research goals. Ultimately it would aid in policy formulation and in following the progress of the Nation. (See also W74-12457) (LaPointe-North Carolina) W74-12472

THE DEVELOPMENT AND OPERATION OF A PROTOTYPE STATE ENVIRONMENTAL INFORMATION CENTER,

East Central State College, Ada, Okla. Environ-mental Information and Media Center. For primary bibliographic entry see Field 10D. W74-12473

COMMUNICATIONS IN ENVIRONMENTAL MANAGEMENT,

Metropolitan Regional Council, Inc., New York.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. VI:35-VI:39, 1974.

Descriptors: *Information exchange. *Environmental management, *Communication, *Regional development, *Decision making, Planning, Frequency, Transmission, Networks, *Communication, Timing, Costs, Administrative agencies, Local

governments. Identifiers: *Television, Communication system, Microwave transmission, World Trade Center, New York City(NY).

Microwave television transmission offers the capability of more efficiently linking together decisionmakers of regional governments. In Sep-tember, 1970, the Metropolitan Regional Council of New York City established a microwave type of closed circuit system using the World Trade

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Center as a central point (a tall building or mountain being needed to establish an unobstructed path between points), connected with 17 points in the metropolitan area. The system, which allows live, two way, bi-directional discussion, is now almost completed and may be extended to branch offices, police stations and hospitals, and coor-dinated with a cable television system. Present strategy is to employ the system to allow decisionmakers more real communication time to monitor specific progress and specific projects. However, local governments are reluctant to buy a system over which they exercise no control, a period of time is required for users to adapt themselves to bi-directional television, utility of such a system must be clearly demonstrated to local governments. A number of problems have arisen including a lack of understanding on how to best use the system, inadequate financing techniques, reluctance of designers to work with small, incrementally increasing systems instead of large systems, and the tendency of the hardware to sometimes impede the discussion. However, such systems will increase comprehensiveness and cohesion so that systematic decisions can be made. (See also W74-12457) (LaPointe-North Carolina) W74-12474

MANAGING AT THE LOCAL LEVEL,

International City Management Association, Washington, D.C.

Final Conference Report for the National Con-ference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. VII:40-VII:42, 1974.

Descriptors: *Local government, *Conferences, *Decision making, *Community development, *Environment, Communications, Pollution, Governmental interrelations, State governments, Information exchange, Political aspects, Standards, Planning, Comprehensive planning. Identifiers: Conference summarization.

The need for strong local government in the environmental movement should be emphasized and discussed: (1) The environmental movement embraces a wide variety of individuals. Conferences are essential for communication. (2) The mass media must be educated to the issues and utilized more effectively than current crisis reporting. (3) Quality of life should be monitored at some base line level so as to include those who have been ex-cluded from society's affluence. (4) We must realize that the politician will make the ultimate decisions, and must develop an understanding of political pressures which burden him. (5) Adaptation to the environment occurs at the local level. Effective community action depends upon a national foundation of basic law, commitment and resources. (6) Traditional programs should invite local initiatives. (7) Environmental managers must adapt themselves to the incremental nature and slower pace of local decisionmaking, due to the proximity of the citizenry to local officials. (8) Local level expertise must be developed to enable local political leaders to better understand and analyze environmental issues. (9) Technology needed by local governments differs from that used by universities and industry. More organizations must be created to furnish the needed technology. (10) Citizen involvement is vital. Strategies must be developed to efficiently incorporate the citizenry in decision-making. (See also W74-12457) (LaPointe-North Carolina) W74-12478

THE COST OF GROUNDWATER VS. SURFACE

Moody and Associates, Meadville, Pa. For primary bibliographic entry see Field 4B. W74-12535

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COMPUTER MANAGEMENT OF A COMBINED

SEWER SYSTEM, Municipality of Metropolitan Seattle, Wash. For primary bibliographic entry see Field 5D. W74-12003

PROCESS/FINANCIAL MODELS. For primary bibliographic entry see Field 6A. W74-12112

AN INVESTIGATION OF THE OPTIONAL ON-LINE CONTROL OF A WATER SUPPLY NET-

WORK, Cambridge Univ. (England). Engineering Lab. For primary bibliographic entry see Field 4A. W74-12143

ECONOMIC EFFECTS OF SUBSIDIES FOR

ECONOMIC EFFECTS OF SUBSIDIES WASTE ABATEMENT, Clemson Univ., S.C. Dept. of Economics. For primary bibliographic entry see Field 5G. W74-12199

BRINE DISPOSAL TREATMENT PRACTICES RELATING TO THE OIL PRODUCTION IN-

DUSTRY, Oklahoma Univ. Research Inst., Norman. School of Civil Engineering and Environmental Science. For primary bibliographic entry see Field 5D. W74-12211

LAND SUBSIDENCE: AN ECONOMIC ANALY-

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources. C. McCauley, and R. Gum.

Available from the National Technical Informa-tion Service as PB-235 913 \$3.00 in paper copy, \$2.25 in microfiche. Completion Report, (1974), 10 p, 1 tab, 9 ref. OWRT A-030-ARIZ(2), 14-31-0001-3503.

Descriptors: *Land subsidence, *Groundwater, *Overdraft, *Arizona, Economics. Identifiers: *Economic analysis.

Land subsidence due to groundwater overdraft has been assumed to be one of Arizona's major water related problems. The premise is investigated from an economic point of view. It is concluded that in the case of Arizona the physical fact of land subsidence has little or no economic significance. W74-12225

SOME EVIDENCE OF ECONOMICS OF SCALE IN HAWAIIAN SUGAR PLANTATION, Hawaii Univ., Honolulu. Water Resources Research Center.

For primary bibliographic entry see Field 3F. W74-12344

PRIMARY DATA ON ECONOMIC ACTIVITY AND WATER USE IN PROTOTYPE OIL SHALE DEVELOPMENT AREAS OF COLORADO: AN INITIAL INQUIRY, Colorado State Univ., Fort Collins. Dept. of

For primary bibliographic entry see Field 6B. W74-12356

WATER PRICING DURING URBAN DEVELOP-

Pennsylvania State Univ., University Park. Dept. of Agricultural Economics and Rural Sociology. F. M. Goode.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 044, \$3.75 in paper copy, \$2.25 in microfiche. Pennsylvania Institute for Research on Land and Water Number 81, June 1964. 60 p, 5 tab, 7 append. OWRT B-033-PA(1). 14-31-0001-3326.

Descriptors: *Public utilities, *Marginal costs, Wells, Municipal water, Pricing, Water costs, *Water uses, Model studies, Interest, Bond issues, Investment

Identifiers: *Urban development.

The objective was to determine if the water payments by the new users are sufficient to pay for the operation and maintenance costs as well as costs associated with developing a new well field.

A model was developed to simulate future system growth. This model generated estimates of the amount of new users' payments available each year to pay for the construction of the new wells. Comparing these estimates to the principal and in-terest payments on the bond issue which financed the well construction gave an indication of whether or not new users paid for the new wells. Also, information was developed on the reated question of extent to which various types of new users pay for the new wells. W74-12366

IMPACT OF POLLUTION ABATEMENT ON CAPITAL ALLOCATION AND PROFITABILI-

Canadian Pulp and Paper Association, Montreal (Ouebec).

For primary bibliographic entry see Field 5G. W74-12426

THE COST OF GROUNDWATER VS. SURFACE

Moody and Associates, Meadville, Pa. For primary bibliographic entry see Field 4B. W74-12535

FACTORS AFFECTING DESIGN, DEVELOP-MENT AND COST OF WELLS, Universal Oil Products, St. Paul, Minn. Johnson

Div. For primary bibliographic entry see Field 8B. W74-12541

THE COST OF GEOPHYSICAL EXPLORA-

For primary bibliographic entry see Field 8B. W74-12544

6D. Water Demand

PROPOSED KIELDER WATER RESERVOIR SCHEME COMPUTER APPLICATION IN YIELD ASSESSMENT,

Northumbrian River Authority (England). For primary bibliographic entry see Field 4A. W74-12130

ESTIMATING RESERVOIR RECREATIONAL VISTS IN INDIANA,

Purdue Univ., Lafayette, Ind. Water Resources Research Center. For primary bibliographic entry see Field 6B. W74-12196

LAND POTENTIALS: FORSYTH COUNTY PHYSIOGRAPHY.

City-County Planning Board, Winston-Salem,

City-County Planning Board, Winston-Salem, North Carolina, December 1968. 48 p. 12 fig. 7 tab, 43 ref, 4 append.

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Descriptors: *Geomorphology, *Land classifica-tion, *Data collections, *Regional analysis, tion, *Data collections, *Regional analysis,
*North Carolina, Climatic data, Soil types, Soil
surveys, Urbanization, Groundwater, Regional development, Comprehensive planning. Identifiers: *Forsyth County(North Carolina), *Winston-Salem(North Carolina).

The physiography of Forsyth County, North Carolina, was studied as part of a larger study to be used for the development of a comprehensive plan for the area. Forsyth County is located in the Northwestern portion of North Carolina. It is a predominately rural county, but it is becoming urbanized. The population in 1968 was about 227,600 and the rural portion was estimated at 39,200. The altitude of Forsyth County ranges between 800 and 1,000 feet. The area is well drained, and lies on the Piedmont of the Blue Ridge Mountains and Great Smoky Mountains. Freezing temperatures occur for about 3 months, and temperatures exceed 89 degrees for about 1.5 months per year. Precipitation averages 44.5 inches annually, with a fairly constant amount received throughout the year. Soil types are generally favorable for urban development, although some limitations do exist. Where not suited for urban development, soils are suitable for use for recreational uses, forestry and agriculture. The geologic base of the area provides essential minerals, including sand, gravel, clay and ground water. Ground water quality is generally acceptable; contamination has thus far been only an isolated problem and hardness and iron content are only rarely troublesome. (Poertner) W74-12241

CHATTANOOGA AREA REGIONAL COUNCIL OF GOVERNMENTS COMPREHENSIVE WATER AND SEWER STUDY: HAMILTON, WALKER AND CATOOSA COUNTIES, BOOK

Hensley-Schmidt, Inc., Chattanooga, Tenn. For primary bibliographic entry see Field 6A. W74-12242

6E. Water Law and Institutions

WATER QUALITY CONSIDERATION FOR THE METAL MINING INDUSTRY IN THE PACIFIC NORTHWEST,

Environmental Protection Agency, Seattle, Wash. For primary bibliographic entry see Field 5G. W74-12085

COMPUTER BASED SYSTEMS--OPPORTUNITIES IN THE NEW OR-

GANIZATION,
For primary bibliographic entry see Field 6A.
W74-12110

SOME EXTENSION SERVICE CAPABILITIES, Georgia Univ., Athens. Cooperative Extension

C. P. Ellington.

In: Proceedings of the Joint Conference on Recycling Municipal Sludges and Effluents on Land, July 9-13, 1973, Champaign, Illinois, The National Association of State Universities and Land-Grant Colleges, Washington, D.C., p 213-214, 1973.

Descriptors: *Research, *Education, *Information exchange, *Local governments, *Water resources, *Recycling, *Municipal wastes, Descriptors: Agriculture.

Identifiers: Community support, County leadership.

The Cooperative Extension Service, created by Congress in 1914, has the ongoing function of providing information from research of the Agricultural Experiment Stations. The present role of this service is to work through county leadership towards changes at local levels. Community support is necessary for any modification of water resources use. Recycling of municipal sludges is one specific area in which education and information should be disseminated to the public. (Prague-W74-12172

INFORMAL OPINIONS

Food and Drug Administration, Washington, D.C.

In: Proceedings of the Joint Conference on Recycling Municipal Sludges and Effluents on Land, July 9-13, 1973, Champaign, Illinois, The National Association of State Universities and Land-Grant Colleges, Washington, D.C., p 215-217, 1973. 217 1973

Descriptors: *Food, *Fertilizers, *Toxicity, *Contamination, *Heavy metals, Pesticides, Crops, Mercury, Lead, Cadmium, Zinc, Organic chemicals measurement, Polychlorinated biphen-

The Bureau of Foods within the Food and Drug Administration asks that caution be used in the application of sludge or effluents as fertilizers. Levels of toxicity are very vague, including contamination by heavy metals such as mercury, lead, cadmium, arsenic, selenium, and zinc. Organic chemicals such as pesticides, PCB's, are also included. Recommended are monitoring operations for food crops and animal feed crops. For example, a test might be set up using both a control and a commercial fertilizer, measuring for pesticides, pathogenic organisms, and heavy metals. (Prague-FIRL) W74-12173

FLOOD CONTROL, NAVIGATION, AND OTHER ALTERNATIVE WATER RESOURCES POLICIES IN MINNESOTA, Minnesota Univ., Minn. Dept. of Agricultural and

Applied Economics.
For primary bibliographic entry see Field 6F.
W74-12206

WATER SUPPLY AND WATER POLLUTION CONTROL CAPITAL PROGRAM 1972-1985. Delaware Valley Regional Planning Commission, Philadelphia, Pa

(1972), 92 p, 14 fig, 15 tab. HUD Grant.

Descriptors: *Planning, *Water pollution control, water pourson control, water pourson control, "Water supply, "Delaware River Basin Commis-sion, "Capital costs, "Regional analysis, "Delaware River, Budgeting, Financing, Water resources development, River basins, Valleys, Project planning, Delaware, Construction costs, Scheduling, Long-term planning. Identifiers: *Capital program, Development pro-

The Water Supply and Water Pollution Control Capital Program 1972-1985 is the official, Board approved, companion working document of the 1985 Regional Water Supply and Water Pollution Control Plan. This 1972 Capital Program con-stitutes a major development in Water Supply and Water Pollution Control Capital Programming in the Delaware Valley Region. For the first time, the long range development of water and sewer facilities has been scheduled for the region on an annual cost basis. This approach, therefore, establishes a significant change in format from that of the preliminary document produced in 1969. The program presents two major scheduling periods. The first is from 1972 to 1977, by individual year; the second aggregates the period 1978 to 1985. The program favorably reflects all decisions of the program tavorably reflects all decisions of the Delaware Valley Regional Planning Commission (DVRPC), since 1969. Projects which have been implemented to data have been deleted. Con-sequently, such changes represent almost a complete turnover of capital projects since 1969 for many counties. A comprehensive study was designed by the DVRPC staff which would provide for a uniform methodology of analysis and application to all projects in the region. In using this approach, scheduling allocations could then be best determined on the basis of regional and environmental needs rather than on political boundaries or influences. Under this method, political areas would not be measured against each other and long range projections would thus be made on the basis of watershed needs. (Poertner) W74-12233

WEBER RIVER BASIN INCLUDING DAVIS COUNTY AND THE OGDEN S.M.S.A.: WATER QUALITY MANAGEMENT PLANNING, PHASE L.PROGRAM DESIGN

Stevens, Thompson and Runyan, Inc., Portland, Oreg. and Nielsen, Maxwell and Wangsgard, Inc., Salt Lake City, Utah. For primary bibliographic entry see Field 6A.

W74-12238

LEGAL PROBLEMS IN WATER POLLUTION CONTROL, New York State Dept. of Environmental Conser-

vation, Albany,

D. F. Metzler.

Preprint No 1891, American Society of Civil Engineers, National Water Resources Engineering Meeting, Washington, D.C. January 29-February 2, 1973. 15 p.

Descriptors: *Water pollution control, *Legal aspects, *New York, Administration, Legislation, Law enforcement, Equity, Permits, Penal-ties(Legal), Pollution abatement, Water quality, Water quality control.

New York State has an agressive and increasingly effective water pollution control program. This program has led to \$3.1 billion of work completed or underway since 1966 and is expected to result in another \$2.5 billion of work to be started in the next 5 years. The experiences gained in this program should be of assistance in the formulation of water pollution control programs by other states and the federal government. Three eras of water pollution control can be described: (1) the initial period, when control was practically non-existent; (2) a period of increased activity in which waters were surveyed and classified and cooperative approaches were used to abate pollution; and (3) the present intense program, highly dependent on legal action against pollutors. As a result of New York State programs, 6 general conclusions were reached: (1) water quality standards provide a sound basis for pollution abatement programs, maintained by limits on specific discharges, (2) water quality regulations should be a part of an overall environmental protection program; (3) enforcement should aim at a strengthening regional solutions; (4) water pollution laws should be expanded and interpreted by a board or commission formed from all parts of society; (5) a well-managed permit system is essential and needs to be supported by a monitoring system; and (6) non-point sources of pollution will require new methods of control, including land-use regulations. (Poertner) W74-12239

TECHNICAL REPORT FROM THE STOCKHOLM UN CONFERENCE, Swedish Water and Air Pollution Research Lab., Stockholm.

For primary bibliographic entry see Field 6G. W74-12401

SURVEY OF ENVIRONMENTAL LEGISLA-TION IN THE GERMAN FEDERAL REPUBLIC (UEBERSICHT UEBER DIE UMWELTGESETZ-

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BUNDESREPUBLIK CERUNG IN DER DEUTSCHLAND),

Technische Universitaet, Darmstadt (West Germany). Wassert und Abwasserforschungsstelle W Brecht.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 59-62,

Descriptors: Europe, *Legislation, *Pollution abatement, *Environmental control, *Pulp and paper industry, Water consumption(Except consumptive use), *Waste water(Pollution), Economics, *Financing, Research and development, Project planning, Potable water, Legal aspects, Regulation, Industrial water, Biological treatment.

Identifiers: *West Germany(German Federal Republic).

Water demands in West Germany presently total about 16 billion cu m per year, of which about 72% is industrial and 14% each is trade and domestic usage. The pulp and paper industry stands in 4th place among all 45 industrial water users, with an annual demand of 930,000,000 cu m in 1969. West German legislative measures provide for both short- and long-term environmental protection, such as extensions of the Water Conservation Law in force since March 1, 1960, notably enforcement and pollution penalty provisions enacted Feb. 28, A 1985 deadline requires biological clarifier installations for 85% of the total pollution. Potable water demand is expected to double by the year 2000, requiring considerable local, regional, deferal financing to treat about 50% of all industrial effluents which are still being discharged into receiving waters. The seriousness with which these problems are being approached is evident from various research and project programs mentioned. (See also W74-12400) (Brown-IPC) W74-12402

FRENCH LEGISLATION AND POLICIES RE-GARDING ENVIRONMENTAL PROTECTION (LEGISLATION ET POLITIQUE FRANCAISES EN MATIERE DE PROTECT L'ENVIRONNEMENT), Societe Aussedat-Rey, Saillat (France). PROTECTION

J. Charbonnieras

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 63-71, 1973. 7 maps.

*Legislation, Descriptors: Europe, *Water pollution control, *Pollution abatement,
*Water pollution control, Legal aspects, Pulp and
paper industry, Governments, Regulation, River basin commissions, Regional dev Planning, Projections, Project planning. development.

The historical development of French legislative measures against water and air pollution is traced from its beginnings in 1810 to the most recent decree of March 27, 1973. Emphasis in the French approach to ecology problems is on regional authorities in charge of managing various natural river basins. Several time-planned stages in anresults. Several time-planned stages in antipollution measures have met with encouraging results. Thus, the 5th 5-year plan (1964-1969) achieved a 10% overall reduction in territorial pollution. The 6th plan (1971-1975) aims at a 20% reduction. (See also W74-12400) (Brown-IPC) W74-12403

LEGISLATION ON ENVIRONMENTAL PRO-TECTION IN SCANDINAVIA, National Water Board of Finland, Helsinki.

In: Proceedings XV EUCEPA Conference on Har-monizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 73-86, 1973.

Descriptors: *Legislation, *Governments, Europe, *Pollution abatement, *Water pollution control, *Environmental control, Planning, Legal aspects, Regulation, Cooperatives, Coordination, Organizations, Administrative agencies, Pulp and

Organization, paper industry.

Hentifiers: *Norway, *Sweden, *Denmark,

Environmental protection laws and regulatory pol-lution-control agencies in Denmark, Finland, Nor-way, and Sweden are reviewed, including cooperative efforts among all Scandinavian countries through the Nordic Council. (See also W74-12400) (Brown-IPC) W74-12404

CANADA'S APPROACH TO ENVIRONMENTAL. POLLUTION CONTROL FOR THE PULP AND PAPER INDUSTRY,

Environmental Protection Service. Ottawa (Ontario). For primary bibliographic entry see Field 5G.

MECHANICAL TREATMENT OF PULP AND

PAPER MILL EFFLUENT,
Nevalainen and Orivuori, Helsinki (Finland). For primary bibliographic entry see Field 5D.

W74-12405

FINAL CONFERENCE REPORT FOR THE NA-TIONAL CONFERENCE ON MANAGING THE ENVIRONMENT.

For primary bibliographic entry see Field 6G. W74-12457

PLANNING FOR QUALITY GROWTH,

Hawaii State Dept. of Planning and Economic Development, Honolulu. For primary bibliographic entry see Field 6G. W74-12461

ENVIRONMENTAL DECISION MAKING.

For primary bibliographic entry see Field 6G.

THE POSITIVE ROLE OF ENVIRONMENTAL MANAGEMENT, Indiana Univ., Bloomington, Dept. of Political

Science; and Indiana Univ., Bloomington. Dept. of Public and Environmental Affairs. For primary bibliographic entry see Field 6G. W74-12464

STATE GOVERNMENTS TACKLE POLLU-

TION, Woodrow Wilson International Center for Scholars, Washington, D.C. For primary bibliographic entry see Field 6G. W74-12465

IMPLEMENTATION OF CITIZEN PARTICIPA-

TION IN THE MUNICIPAL PROCESS, Environmental Protection Agency, Washington, D.C. Technical Assistance Research Programs. For primary bibliographic entry see Field 6G. W74-12468

ENFORCING ENVIRONMENTAL LAW IN THE

CITY, New York City Corporation Counsel. N. Redlich.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. V:59-V:61. 1974.

Descriptors: *Law enforcement, *Legal aspects, Descriptors: "Law enforcement, "Legal aspects, "Legal review, "Regulation, "Environmental control, Local governments, Pollution abatement, Standards, Permits, Administrative agencies, Urbanization, "New York.
Identifiers: Enforcement, Environmental law,

*New York City(NY).

For environmental laws to be efficiently enforced an urban setting there must be a restructuring of city agencies and traditional enforcement techniques must give way to new more easily administered methods. In New York the many departments which addressed environmental problem areas, for example the Sanitation Dept., the Dept. of Water Resources, etc., have merged into the Environmental Protection Administration, which has the ability to weigh the total effect of a particular decision. Representatives from this agency also sit on interdepartmental commissions. and can bring to these commissions a broad scale and expertise in many subcategories of environ-mental knowledge. Traditional enforcement techniques are totally unsuitable for an urban setting. Imposition of standards on the polluting devices (incinerators, noise generators, and fuel burning equipment) have been more effective for the City of New York. Permits to operate such devices are now required, providing greater control by the enforcing agency which also has the power to test devices to determine if they meet proper standards. A nine man environmental control board has been created to remove pollution test cases from already overcrowded court calendars. This board has the power of review, may issue cease and desist orders, permit relocation, and impose civil penalties of up to \$100/day. However these fines must still be enforced in court. Citizen enforcement has also been developed. If no action is forthcoming from the agency, after a complaint is filled, the citizen may take the complaint to court and receive a share of any fines the court might order the offender to remit. (See also W74-12457) (LaPointe-North Carolina) W74-12471

STATE RESPONSIBILITY IN MANAGING THE

ENVIRONMENT, Connecticut Dept. of Environmental Protection.

D. W. Lufkin.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. VII:10-VII:12. 1974.

Descriptors: *State governments, *Environmental Descriptors: 'State governments, 'Environmental management, 'Connecticut, Standards, Solid waste, Electric power production, Fuels, Electric power cost, Wildlife habitats, Legal aspects, Legislation, Economic feasibility. Identifiers: Department of Environmental Protections

The philosophy of the new federalism is to leave to the states the enforcement at the regional level of environmental standards set by the federal government. The federal government should set tives, support state governments both technically and financially, and enforce only when the state government is not carrying out its responsibilities In Connecticut the Department of Environmental Protection was established under Act 872 by uniting under one department those environmental responsibilities previously scattered among many state agencies, among them air, water, pesticides, radiation and all state natural resources for recreation. With the General Electric Company a solid waste program was established setting up 23 watersheds, separation and reuse of noncombustible materials, and disposal of combustible materials, all at a cost of \$10 per ton. A solid waste authority was created with a bonding capability of \$250 million. The main difficulty is the lack of administrative enforcement options, now limited to drawn out court proceedings. A recent registration program for the 16,000 point sources of air pollu-

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tion resulted in 25% noncompliance, and it is in-feasible to bring the 4000 non-compliers to court. However, legislation will soon be passed which gives administrators a fining capability. Fines will be levied by estimating the difference between costs of non-compliance (legal fees, operating costs saved, capital use saved) with that of compliance (equipment costs, opportunity costs, operation costs), and will be discounted over time. Such a running fine should be an incentive for compliance and should eliminate all but the most meritorious suits. (See also W74-12457) (LaPointe-North Carolina) W74-12475

HOW A REGIONAL ORGANIZATION AS-SUMES ENVIRONMENTAL RESPONSIBILITY, Metropolitan Council of the Twin Cities Area, Minn. F. T. Lamm.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. VII:13-VII:18. 1974.

Descriptors: *Regional development. *Environmental management, *Local govern-ment, Political aspects, Air pollution, Solid waste, Water pollution, Recreation, Budgeting, Land use, Legislation, Planning, Federal Water Pollution Control Act.
Identifiers: Twin Cities Area Metropolitan Coun-

Many issues of environmental impact must be handled on the regional level. However due to the relative newness of regional government, regional organizations must take bold affirmative steps in assuming their responsibilities and establishing their authorities. Designation by HUD as the areawide planning organization with appropriate cer-tifications and as a regional clearinghouse under Bureau of the Budget Circular A-95 are important indications of environmental responsibility. Some methods for assuming environmental reaponsibilities for air quality, solid waste management, water resources, water pollution, recreation and protection of open spaces as handled by the Twin Cities Area Metropolitan Council are discussed briefly. The state is primarily responsible for air quality. The Minnesota Pollution Control Agency is able to delegate many powers to regional implementation organizations for cooperative development of a state-wide implementation plan for air quality. The Metropolitan Council has developed a coordinated program with the state for solid waste manage-ment. Funding is available from EPA for regional water resource planning, and further funds should become available under sections of the Federal Water Pollution Control Act. Water resource planning offers an excellent opportunity for replanning offers an excellent opportunity for re-gional agencies to provide an important service for local governments. In the Twin Cities area, the dif-ferent watershed districts are submitting their Overall Plans to the Metropolitan Council for review and approval. Local governments are reluctant to consider open space protection in zon-ing and land use policies. Efforts have been con-fined to persuasion and the creation of an Open Space Advisory Board. (See also W74-12457) (LaPointe-North Carolina) W74-12476

THE COOPERATIVE APPROACH TO EN-VIRONMENTAL ENHANCEMENT,

State Univ. of New York, Albany. For primary bibliographic entry see Field 6G. W74-12477

OIL, GAS, AND WATER LAW-TODAY AND TOMORROW, Gee and Hearon, Austin, Tex.

Gee and Heaton, Austui, 162.

J. C. Dougherty.
In: Oil and Water--A Symposium, Bureau of Economic Geology, Texas University, Austin, January 29, 1965. p 56-64, (1965). 19 ref.

Descriptors: *Legal aspects, Laws, Statutes, Ordinances, *Groundwater, Recycling, Judicial decisions, Water law, Economics, Legislation, Project planning, Public health.

Identifiers: Pooling, Slant holes, *Legal tomor-rows, Railroad commission, Supreme Court, Texas water commission, Pollution control board, Federal Water Resources Act of 1964.

The concept is discussed of 'legal tomorrows'--or steps that may be taken soon in oil, gas, and water law by courts, administrative agencies, and legisla-tive bodies. The first 'legal tomorrow' is compulsory pooling of interests in order to give each land tract owner his fair share of recoverable production, while at the same time efficiently managing production from a reservoir. The legislative history of pooling is outlined and a proposed pooling bill is listed. The second 'legal tomorrow' concerns jurisdiction over salt water disposal; recent legislation and court cases are cited. The third 'legal tomorrow' is in the developing guidelines for Com-mission regulation of the slant hole problem where directional surveys disclose greater than permissible vertical deviation. The Supreme Court has de-nied to the Railroad Commission power to devise and assess penalties of its own making not specifically authorized by statute. An effort to coordinate the work of the Texas Water Commission, the Texas Water Development Board, and the Texas Water Pollution Control Board and to integrate them into a long-range State described. (Campbell-NWWA) State Water Plan is

OIL AND GAS VERSUS WATER IN THE SOUTHWEST: CONFLICT OR COMPROMISE, Humble Oil and Refining Co., Corpus Christi, Tex. R. E. Faggioli

In: Oil and Water--A Symposium, Bureau of Economic Geology, Texas University, Austin, January 29, 1965. p 7-20 (1965).

Descriptors: *Legal aspects, *Groundwater, Conservation, Laws, Ordinances, Statutes, Economics, Public health, Industries, Potable water, Aquifers, Saline water, *Oil industry, *Southwest US, *Texas.

The transition from a pre-1930 agrarian economy in Texas to current water needs for irrigation, municipal, and industrial purposes has been accompanied by legislative action directed toward conservation of this important natural resource. Numerous federal and state agencies are interested in Texas water, but the four principal organizations fexas water, but the four principal organizations for state-wide water jurisdiction are: Texas Water Commission, Texas Railroad Commission, Water Pollution Control Board, and Texas Water Development Board. The competition for subsurface water use resolves itself into two principal problem areas: depletion of ground water and pollution of ground water. The major part of the salt water produced in Texas was being injected as far back as 1961. Continued progress, including additional secondary recovery projects, has been ac-complished since that time. Additional background in the geology of ground water should be con-sidered on an academic level and in industry application. Prepared with a factual background a geologist can make himself aggressively available to industry organizations which work closely with governmental agencies having responsibilities re-lated to water resources. As a result, the geologist should be in a position to give aid toward leading the conflict in water demands through compromise to compatibility. (Campbell-NWWA) W74-12549

MOHAWK UTILITIES, INC. V. PUBLIC UTILI-TIES COMM. (APPEAL FROM PUBLIC UTILI-TIES COMMISSION ORDER). 307 N.E.2d 261 (Ohio 1974).

Descriptors: *Ohio, *Judicial decisions, *Public utility districts, *Water contracts, *Water alloca-

tion(Policy), Water distribution(Applied), Regulation, Legal review, Water law, Jurisdiction, Water policy, Water rights, State governments, Public utilities, Legal aspects, Contracts, Land tenure, ater districts.

Identifiers: Water rights(Non-riparian).

Plaintiff utility company appealed in order of the defendant regulatory commission directing the plaintiff to cease collecting water-availability charges. The sale contracts and warranty deeds for all lots sold in the Lake Mohawk subdivision contained provisions for water-use and water-availa-bility charges. Each lot was assessed a fixed water-availability charge until the owner hooked up to the water system, at which time the charge became a fixed water-use charge in the same amount. Owners who had more than one lot were assessed the charge on each lot owned. On complaint of land owners the defendant ruled that the charge was unreasonable and unlawful and ordered it discontinued. This action followed. The Ohio Supreme Court upheld the plaintiff's contention that the commission's ruling was based on an erroneous interpretation of an earlier Ohio Supreme Court decision, but denied plaintiff's contention that the commission had no jurisdiction over the plaintiff's rates. Reversing the order of the commission, the court ruled that a restrictive covenant in a contract for sale of land assessing a water-availability charge is not per se contrary to law. (Deckert-Florida) W74-12602

CONTROLLING ACTIVITIES OF COASTAL WETLANDS.

N.C. Gen. Stat., sec. 113-230 (1971).

Descriptors: *Wetlands, *North Carolina, *Shore protection, *Coastlines, *Coastal engineering, Coasts, Structures, Regulation, Decision-making, Legislation, State governments, Legal aspects, Wildlife conservation, Administrative agencies, Aesthetics, Public health, Safety, Commercial fishing, Coastal marshes, Eminent domain, Penalties(Legal), Marshes.
Identifiers: *Administrative regulations, *Coastal

The Director of the North Carolina Department of Conservation and Development, in order to promote the public safety and health, and to protect wildlife and marine fisheries, is permitted to promulgate regulations concerning the altering of coastal wetlands. Before adopting or repealing any regulation there must be a public hearing in the county where the coastal wetlands are located. Notice must be given to any owner or claimed owner of such wetlands as well as to interest state agencies. Any order will be recorded with the re-gister of deeds in the county where the land is located. A violation of any regulation will constitute a misdemeanor. Any person possessing an affected interest in the land may petition the superior court to determine whether the order so restricts the use of his property as to constitute a taking without compensation. If such a taking is found to have occurred, the order will be of no force, and the state will then be required to institute eminent domain proceedings. (Sperling-W74-12603

WATER POLLUTION POLICY.

. Environmental Conservation Law, secs. 17-0101 thru 17-0105 (1972).

Descriptors: *Water pollution, *Water quality, *Water pollution control, *Water policy, *Water pollution treatment, New York, Legislation, Adpollution treatment, New York, Legislation, Ad-ministration, Water conservation, Environmental sanitation, Waste disposal, Water pollution sources, Waste water treatment, Water supply, Water law, Water quality standards, Public health.

Water Law and Institutions—Group 6E

Water pollution control and its effects on fish, wildlife, industrial use and public health and enjoy-ment are considered. The purpose is to prevent any new pollution and abating existing pollution, thereby safeguarding the waters of the state of New York, under a program consistent with the declaration of policy. Definitions are set forth to be used in reference to the titles of the statute. Definitions are included for the terms persons, waters, marine district, sewage, standards, sewer systems, treatment works, outlets and shellfish. (Sutton-Florida) W74-12604

DEPOSITING TRASH, GARBAGE, ETC., ON LANDS OF ANOTHER OR IN WATERS OF THE

N.C. Gen. Stat., secs. 14-134.1 (1965).

Descriptors: *North Carolina, *Water pollution sources, *Legislation, *Garbage dumps, Sanitary engineering, Regulation, State governments, Legal aspects, Municipal government, Water conserva-tion, Watershed protection, Land management, Permits, Landfills, Administration.

It is unlawful for any person, firm or municipal organization to place or leave any trash or waste materials upon the lands of another without the written consent of the owner. Whether the materials are deposited there permanently or temporarily is immaterial. It is also unlawful, unless specifically authorized by law, to place or deposit, temporarily or permanently, any such waste materials in any waters within the state of North Carolina, including any waters over which the state has jurisdiction. It shall not be unlawful to deposit such waste materials in a public dump maintained by a municipality or county. A violation of this statute is a misdemeanor punishable by a fine of not more than \$500.00 or imprisonment of not more than six months. (Sperling-Florida) W74-12605

WATER AND WATER SUPPLY POLLUTION. N.J. Stat. Ann., ch. 26:3B-4 (Supp. 1973), as amended, ch. 32, sec. 1 (1973) Laws of New Jer-

Descriptors: *New Jersey, *Legislation, *Public health, *Waste water(Pollution), *Water pollution control, Water pollution sources, State governments, Regulation, Safety, Water supply, Water conservation, Industrial wastes, Municipal Municipal wastes, Sewage effluents, Discharge(Water), Waste water disposal, Farm wastes, Bodies of water, Wildlife conservation, Aesthetics, Social aspects, Water quality, Water pollution treatment. Identifiers: Hazardous substances(Pollution).

person, corporation, or municipality is prohibited from depositing, accumulating, or providing storage facilities for certain delineated substances. Such substances include: human ex crement; decomposable animal or vegetable matter; domestic, factory, workshop, mill or slaughterhouse refuse; and sink, laundry, milk, creamery, or cheese house waste. These and any other polluting matter are prohibited if dealt with as to gain access to any well, spring, stream, or any body of water, including oceans and estuaries. The prohibition applies only if the disposal causes or threatens injury to any person in health, com-fort or property, or if the pollution causes or threatens degradation of water quality resulting in damage to the aquatic community or wildlife in and adjacent to the affected water body. (Sperling-Florida) W74-12606

LOWRY V. NORRIS LAKE SHORES DEVELOP-MENT CORP. (ACTION BY LANDOWNERS TO ENJOIN DEVELOPMENT CORPORATION FROM REQUIRING PURCHASE OF METERS

AS CONDITION TO CONTINUING WATER SERVICE).

203 S F 2d 169 (Ga 1974)

Descriptors: *Georgia, *Judicial decisions, *Water contracts, *Legal aspects, *Water law, Land tenure, Water rights, Equity, Water distribu-tion(Applied), Domestic water, Water conservation, Water allocation(Policy), Water policy, Water management(Applied), Water supply, Water supply development.
Identifiers: *Estopple, *Evidence, *Injunctive relief, *Water rights(Non-riparian).

Plaintiff lot owners brought suit against the defendant development company to enjoin defendant from requiring plaintiffs to purchase water meters as a condition to continued water service. The defendant had been furnishing water at a fixed rate, but wished to install water meters, charge a fee for the meters, and charge for water use. The plain-tiffs argued that the defendant was contractually obligated under the plaintiffs' deeds to furnish water at a fixed rate of \$10 per quarter. They also argued that statements made by salesmen at the time plaintiffs purchased their lots, equitably estopped the defendant from refusing to sell water to the plaintiffs at \$10 per quarter. The trail court granted summary judgment for the defendant and plaintiffs appealed. The Supreme Court of Georgia affirmed, ruling that there was nothing contained in the deed which obligated the defendant to furnish water, and mere evidence that the defendant instructed its salesmen to sell prospective buyers that water would be provided for a given flat fee, did not create an equitable estoppel or contractual obligation to furnish water at the initial rate. (Deckert-Florida) W74-12607

POTOMAC VALLEY CONSERVANCY DIS-

Committee on Public Works, (U.S. House) H.R. Rep. No. 1405, 91st Cong, 2nd Sess (1970). 18

Descriptors: *Interstate compact, *River basin commissions, *Legislation, *Federal government, *Water pollution control, State governments, Budget. Administration, Government finance, Coordination, Natural resources, Conservation, Land resources, Delaware, Water resources development, Water resources, Water law, Economic aspects, Public health, Water treatment. Administrative agencies. Identifiers: Congressional hearings.

A report is presented on congressional hearings on amendments to the compact creating the Potomac Valley Conservancy District and establishing the Interstate Commission on the Potomac River Basin. The purpose of the legislation is to broaden the authority of the Commission to include management of water resources and associated land resources. Its present authority is restricted to water pollution abatement. The Commission is to provide a liason between public and non-public agencies in the formulation and coordination of plans and programs for the protection and development of water and land resources. A provision in the original compact was deleted which limited the total contributions of the signatories to less than \$30,000 annually. A proposed federal interstate compact, which is modeled after the existing Delaware River Basin Compact is presently under review. In view of increasing costs the Commission will have to retrench its presently restricted activities unless there is prompt action to remove the ceiling upon contributions. (Sperling-Florida)

AUTHORIZING THE SECRETARY OF THE IN-TERIOR TO CONSTRUCT, OPERATE, AND MAINTAIN THE NARROWS UNIT, MISSOURI

RIVER BASIN PROJECT, COLORADO, AND FOR OTHER PURPOSES.

Committee on Interior and Insular Affairs (U.S. House). H.R. Rep. No. 1132, 91st Cong, 2nd Sess (1970). 13

Descriptors: *Cost-benefit analysis, *Legislation, *Flood protection, *Irrigation, *Multiple purpose project, Administration, Federal government, Administrative agencies, Government finance,
*Colorado, Project planning, River basin, Water resources development, Water requirements,
Water allocation(Policy), Groundwater resources. Recreation, Wildlife conservation, Hydroelectric powerplants, Aquifers, Confined water, Boating, Economic aspects, Fishing

Identifiers: Congressional hearings.

A report is presented on a bill, favoring recom-mendation, to authorize the Secretary of the Interior to construct, operate, and maintain the Narrows unit in the Missouri River Basin project in Colorado. The Narrows unit was included in the general comprehensive plan of the Missouri River Basin project authorized by the Flood Control Act of 1944. The Narrows unit is a multiple purpose project that will provide maximum feasible utilization of the surface water resources of the area. It will provide supplemental irrigation supplies to 166,370 acres of presently irrigated land. It will also protect the South Platte River Basin from floods originating upstream. Outdoor recreational opportunities will be significantly increased. More wildlife habitat will be created in the plains region and hydroelectric power will be produced. Groundwater use in the past has depleted the aquifer supplies. At present surface flows and aquifers are not sufficient for efficient irrigation. The estimated cost of the unit as of 1969 was \$68,050,000. (Sperling-Florida)

WATER BANK ACT--REPORT.

Committee on Agriculture and Forestry (U.S. Senate). Sen. Rep. No. 1393, 91st Cong, 2nd Sess (1970). 8 p.

*Administrative Descriptors: agencies. *Waterfowl, control(Power). Supervisory *Nests, *Migratory birds, Wetlands, Conserva-tion, Agriculture, Water conservation, Water resouces, Reclamation law, Water rights, Projects, Water law, Decision making, Environmental effects, Costs, Natural resources, Marshes, Water resources development, Water manageeffects, Costs, Natural resources, Marsnes, Water resources development, Water manage-ment(Applied), Adoption of practices, Adminis-tration, Water policy, Ponds, Lakes. Identifiers: *Coastal zone management.

The Secretary of Agriculture is authorized to enter into 10 year renewable contracts with landowners and operators of migratory waterfowl nesting and breeding areas for the conservation of water on specified wetlands. During the period of the con-tract, the landowners agree not to drain, burn, till. or otherwise destroy the welland areas and not to use such areas for agricultural purposes, as deter-mined by the Secretary. In return for the agree-ment, the Secretary of Agriculture makes payments to the owner or operator. The rate of annual payments is determined by the Secretary and may be increased if the owner or operator agrees to permit, without other compensation, access by the general public for hunting, trapping, fishing, and hiking. The bill also authorizes the Secretary to share the cost of establishing and maintaining conservation and development practices on the wet-lands and adjacent areas. The bill requires the Secretary to carry out its provisions in harmony with wetlands programs administered by the Secretary of the Interior and to utilize the technical and related services of appropriate state, state, and private conservation agencies to insure proper coordination. (Kelly-Florida) W74-12610

Group 6E-Water Law and Institutions

OCEAN DUMPING CONVENTION IMPLEMEN-TATION.

Committee on Merchant Marine and Fisheries (II.S. House).

H.R. Rep. No. 568, 93rd Cong, 1st Sess (1973). 17

commissions. *International Descriptors: Legislation, *Waste disposal, *Navigation. *Water pollution control, Water pollution, Oceans, Federal jurisdiction, Federal government, International law, International waters, Foreign waters, Domestic waters, Administrative agen-cies, Ships, Adoption of practices, Navigable waters, Oil, Water law, Water policy, Legal aspects.

Identifiers: Coastal waters, Congressional hearings.

The Committee on Merchant Marine and Fisheries of the U.S. House of Representatives amended the Marine, Protection, Research and Sanctuaries Act of 1972. The amendment implemented those features of the recent Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter not presently included in the statute. The Act regulates the dumping of materials into ocean waters within U.S. jurisdiction. The Convention made a similar international agreement to regulate dumping of waste materials. The commit-tee received the Administration's proposed amendment in February 1973, received testimony from witnesses representing several government departments supporting enactment of the amended bill, and approved it in September 1973. The amendment expands the coverage of the bill in regulating U.S. vessels and aircraft, materials which may be dumped, and federal agency activi-ties already controlled under the Act. (Dillingham-W74-12611

AUTHORIZING AND PROVIDING FOR CON-STRUCTION OF A WATER DISTRIBUTION SYSTEM AND A WATER SUPPLY FOR THE SOBOBA INDIAN RESERVATION.

Committee on Interior and Insular Affairs (U.S.

H.R. Rep. No. 1017, 91st Cong, 2nd Sess (1970). 18

Descriptors: *California, *Administration, *Legal aspects, *Water supply, *Federal reservations, Water, Resources development, Water requirements, Water allocation(Policy), Water distribution(Applied), Land ownership, Irrigation, Domestic use, Federal government, Administra-tive agencies, Decision-making, Construction, Economic aspects, Political aspects, Water dis-tribution. Farm use, Water law, Water contribution, Farm use, Water law, Water veyance, Conduits, Water works, Release. Identifiers: Soboba Indian reservation(Calif).

The Secretary of the Interior is authorized to ap prove an agreement entered into by the Soboba Band of Mission Indians. The agreement releases an Indian claim against the Metropolitan Water District of Southern California and the Eastern Municipal Water District. In return the agreement provides for the construction of a water distribu-tion system and a water supply for the Soboba In-dian Reservation. Payment of \$30,000 will be made by Metropolitan to the Secretary of the Interior for the benefit of the Indians. This payment will be made only after the lands that comprise the Soboba Indian Reservation are annexed to Metropolitan. All released claims issued from the construction of a tunnel through the San Jacinto mountains. The release will become effective upon the completion of the concurrent annexation of the reservation lands and the execution of the water service agreement. There shall be a joint determination of additional water supply and distribution facilities in order to provide domestic and irrigation water to the reservation Indians. (Sperling-Florida) W74-12612 JURISDICTIONAL PROBLEMS IN CANADA'S OFFSHORE, British Columbia Univ., Vancouver.

. Beauchamp, M. Crommelin, and A. R. Thompson.

Alberta Law Review, Vol 11, No 3, p 431-469, 1973. 6 fig, 145 ref.

Descriptors: *Jurisdiction, *Canada, *Operations, *Continental shelf, *Natural resources, Resources development, Offshore platforms, Oil, Oil industry, Mineralogy, Exploration, Exploitation, Judicial decisions, Foreign countries, Constitutional law, International law, Legal aspects, Oceans, Continental slope, International waters, Water law, Water policy.

Canada's submerged continental margin includes both the continental shelf and the continental slope. Their combined area is estimated to cover almost two million square miles. As oil and gas exploration activities concentrate in offshore regions, it is inevitable that problems such as the extent of international boundaries and federalprovincial control over offshore resources will be encountered. The historical origin of offshore rights, current international law on the subject and various methods of determining boundaries are analyzed. The federal-provincial issue is discussed with emphasis on constitutional aspects, resource sharing and administration of the offshore opera-tion. Included is a comparative study between Canada, Australia and the United States with respect to the control, development and exploitation of offshore resources. Finally, the applicability of anchillary federal and provincial laws to the offshore region is examined. (Ritchie-Florida) W74-12613

YUMA IRRIGATION PROJECT-NOTICE OF OPERATION AND MAINTENANCE CHARGES. For primary bibliographic entry see Field 3F. W74-12614

HIGH SEAS OIL PORT ACT.

H.R. Rep. No. 692, Comm. on Merchant Marine and Fisheries, 93d Cong, 1st Sess, 1974. 43 p.

*Water Descriptors: pollution *Legislation, *Federal government, *Oil pollution, *Continental shelf, Regulation, Water law, Oceans, Governmental interrelations, Interagency cooperation, Pollution taxes(Charges), Water quality control, Law enforcement, Water pollution youngs, Water quality, Sea water, Foreign trade, Adoption of practices, Environmental effects. Identifiers: *Licenses, *Absolute liability, *Coastal waters, *Coastal zone management, *National Environmental Policy Act, Congressional hearings, Administrative regulations.

The Committee reports favorable on the High Seas Oil Port Act as amended. The bill will amend the Merchant Marine Act of 1936, and will authorize the Secretary of Commerce to issue permits for construction and operation of certain offshore port and terminal facilities. The Act is designed to minimize adverse impacts on the marine environment which result from construction and operation of high seas oil ports; the ports are means for of high seas on poins, the poins are means to receiving petroleum products transshipped to the United States. The report represents the consensus of the Merchant Marine and Fisheries Committee and the Committee on Interior and Insular Affairs, which was considering similar legislation. The Secretary of the Interior would establish rules and regulations for protection of the marine enand regulations for protection of the marine en-vironment. The Coast Guard would be charged with enforcement of the Act. Civil and criminal penalties are provided. A High Seas Oil Port Lia-bility Fund would be created by collecting a per barrel fee from the owners of any oil off-loaded at an offshore facility. The fund would be absolutely liable for any damages resulting from operations of the facilities. (Deckert-Florida) W74-12615

A PLAN FOR MICHIGAN'S SHORELANDS.

Michigan Dept. of Natural Resources, Lansing. August, 1973. 135 p, 29 fig, 17 tab, 87 photo, 4 ap-

Descriptors: *Michigan, *Great Lakes, *Zoning, *Shores, *Water resources development, Public benefits, Land management, Administrative decisons, Social aspects, Lakes, Rivers, Planning, Long-range planning, Natural resources, Public lands, Environment, Environmental effects, Land development, Wetlands, Comprehensive planning.

Michigan's Great Lakes' natural shorelands are disappearing as dunes and trees are being replaced by residential homes, motels, campgrounds, marinas, power plants and other signs of civiliza-tion. While in the past there has been little or no shoreland planning, in the future a new management approach must be adopted or the natural beauty and uniqueness of the shorelands will be destroyed and lost forever. Since a no-develop-ment policy is unrealistic, controlled development is the basis of the Michigan plan. The basic principles underlying the plan are that any new develop-ments in the shorelands should be limited to those activities and facilities which specifically require a shoreland location, that permissible developments should be planned, designed, constructed and operated so as to harmonize with the capacities and tolerance limits of the natural shoreland ecosystem. Public policy should foster and facilitate, to the maximum extent possible, the acquisition of significant shoreland environmental areas. (Barnes-Florida) W74-12616

SURVEY OF ENVIRONMENTAL LEGISLA-TION.

For primary bibliographic entry see Field 6G.

DEEPWATER PORTS.

Hearings--Subcomm on Water Resources and Subcomm on Energy, Comm on Public Works, U.S. House of Representatives, 93rd Cong, 1st Sess, October 9, 10, 11, 1973. 379 p, 21 fig, 4 tab.

*Rivers and Harbors Descriptors: Legislation, *Deep water, *Engineering structures, *Harbors, Coasts, Port authorities, Transportation, Navigation, Offshore platforms, Permits, Regulation, State governments, Federal government. Oil reservoirs, Oil, International government, Oil reservoirs, Oil, international waters, Oil spills, Water pollution, Environmental effects, Engineering, Fuels, Water pollution sources, Ships, Adoption of practices. Identifiers: *Coastal waters, *Oil Pollution Act, *Administrative regulations, *Congressional

*Administrative regulations, hearings, *Licenses.

This bill is an amendment to the Rivers and Harbors Act of 1965. It would establish a Federal licensing program for the regulation of construction and operation of port facilities behond three nautical miles from the coast of the United States. Such facilities are used principally for unloading crude oil and petroleum products between deep-draft vessels and the United States. Federal is-suance of a license and its retention by the applicant would be dependent upon the applicant's satisfactory demonstration that the operation of the proposed facility will continue to meet requirements for protection of the public against adverse significant effects in the environment, international navigation, and land use along adjacent coasts. The hearings on this bill considered the alleged econome and environmental advantages ac cruing from deepwater ports, the possibility of their increasing the supply of fuel in the U.S., the testimony of expert witnesses regarding criticisms and commendations of specific points of the bill, as well as the depositions and testimonies of states and companies interested in deepwater port con-struction. (Dillingham-Florida) W74-12619

Nonstructural Alternatives—Group 6F

CORPS OF ENGINEERS DREDGE AND FILL JURISDICTION: BUTTRESSING A CITADEL UNDER SIEGE.

For primary bibliographic entry see Field 5G.

OIL SPILLS: HOW SERIOUS A PROBLEM. For primary bibliographic entry see Field 5B. W74-12621

WATERSHED PROJECTS. For primary bibliographic entry see Field 4D. W74-12622

ENVIRONMENTAL DEFENSE FUND V. FROEHLKE (REQUIREMENTS FOR ENVIRON-MENTAL IMPACT STATEMENTS). 473 F 2d 346 (8th Cir 1972)

Descriptors: *Flood control, *Channel improvement, *Judicial decisions, *Legislation, *Flood protection, Water law, River basin development, Flood plain zoning, Legal aspects, Water resources development, Water policy, Flood plain, Comprehensive planning, Planning, Chan-nelization, Water resources development. Identifiers: Environmental Impact Statements.

The case challenges the Cache River-Bayou DeView Channelization Project. The project was authorized by the Flood Control Act of 1950. It called for clearing, realigning, enlarging and rechanneling portions of the Cache River and its tributaries. The plaintiff attacks the inadequacy of the environmental impact statement. Secondary questions charge violations of the Water Bank Act, the Fish and Wildlife Coordination Act or the Flood Control Act. The court held that it had a right to make a substantive review of the impact statement on the merits. The court stated that the complete formal impact statement represents an accessible means for opening up the agency deciaccessible means for opening up the agency decision-making process and subjecting that process to critical evaluation by those outside the agency. The court found the plaintiff's other contentions without merit and remanded the case to the District Court with instructions to require the Corps to submit a revised impact statement. (Gragg-Florida) W74-12623

ADAMS V. MONTANA POWER CO. (ACTION TO DETERMINE ADMIRALTY JURISDICTION).

354 F Supp 1111 (D C Mont 1973).

Descriptors: *Montana, *Judicial decisions, *Navigable waters, *Water law, *Legal aspects, State jurisdiction, Federal jurisdiction, Jurisdic-tion, Interstate, Constitutional law, Regulation, Ships, Transportation, Navigation, Law enforcement, Rivers, Missouri River, Navigable rivers, Inland waterways, Water policy.

Action was brought against a power company for death of decedent drowned in a small boat which capsized in the discharge from the power com-pany's dam on the river. The court held that the 25-mile navigable stretch of the Missouri River was used by small boats only and had nothing resembling traditional maritine activity thereon. Thus it was the type of water which the law of admiralty should govern and Montana courts could exercise jurisdiction over it and apply familiar concepts of Montana tort law. Under the 'locality rule', once rather generally accepted, if a tort oc-curred on what was a navigable water, then admiralty jurisdiction automatically followed. Ad-miralty law developed out of the need of commerce on the seas for a law which related to the needs of that commerce. Thus if the problem is what body of law should govern activities on water it is unrealistic to ignore facts regarding maritime activity. (Ritchie-Florida) W74-12624 THE ROLE OF THE POLITICAL IDIOM IN JU-RISDICTIONAL CONFLICTS OVER OFF-SHORE OIL AND GAS, Johns Hopkins Univ., Washington, D.C. School of Advanced International Studies.

E. Treby.

Journal of Maritime Law and Commerce, Vol 5, No 2, p 281-297, January 1974. 57 ref.

Descriptors: *Offshore platforms, *Jurisdiction, *Oil exploration, *Oil industry, *Legal aspects, Economic aspects, Federal government, State governments, International law, International waters, Institutional constraints, Oceans, Geology, Natural resources, Water resources develop-ment, Court decisions, Minerals, Land ownership, Adoption of practices, Water resources, Planning, Coordination, Administration, Gasoline, Environmental effects. Water

Identifiers: *Coastal zone management, *Coastal

Offshore wells are the source of an increasing percentage of new petroleum reserves. Continental shelves currently produce one-fifth of world petroleum output and are expected to increase that share to one-third within ten years. Geological surindicate that adequate reserves exist and can be found to meet future demand. The question is whether such reserves can be economically brought into production in the next decade. Beyond the need for new technology, there are legal and political disputes involving jurisdiction over off-shore minerals. These disputes take two forms: international disputes over a body of water bordered by two or more sovereign nations, or domestic disputes within federal systems between the central government and its constituent units The U.S. Government was uninterested in exerting jurisdiction prior to the Truman Declaration of 1945. Before the doctrine Washington did not question state government ownership of sub-merged lands as established by Supreme Court decisions. Though the Truman Proclamation in it-self only made statements about the shelf vis-a-vis other countries it signaled the beginning of federal control and end of state control of the sea bed. (Sperling-Florida) W74-12625

6F. Nonstructural Alternatives

FLOOD PLAIN STUDIES IN ONTARIO.

Dillon (M. M.), Ltd., Toronto (Ontario).

F. I. Lorant. In: Proceedings of Canadian Society for Civil Enin: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 64-76, 1973. 6 plate.

Descriptors: *Flood plains, *Flood protection, *Flood plain zoning, *Non-structural alternatives, Mapping, Design storm, Flood frequency, Design flood, Canada.
Identifiers: *Ontario.

The Province of Ontario minimizes flood damages by the regulation of development in flood plains. Fundamental to the application of such preventive regulations is the accurate definition of the flood plain. Current procedures in Ontario for such flood plain studies including design frequencies, and estimated flood peaks are described. Commonly used photography and mapping scales and cost estimates are given. (See also W74-12087) W74-12090

FLOOD CONTROL, NAVIGATION, AND OTHER ALTERNATIVE WATER RESOURCES POLICIES IN MINNESOTA,

Minnesota Univ., Minn. Dept. of Agricultural and Applied Economics.

Available from the National Technical Information Service, Springfield, Va 22161 as PB-235 821, \$3.25 in paper copy; \$2.25 in microfiche. Minnesota Water Resources Research Center, St. Paul, Aug. 1974, Mimeographed Rept. 25 p, 3 ref. OWRT B-054-Minn(4), 14-31-0001-3601.

Descriptors: *Water resources, *Flood control, *Navigation, Environmental control, *Minnesota, *Water policy, Flood plains, Costs, Mississippi River, Legal aspects, Dredging planning, Non-structural alternatives. Dredging, Identifiers: Flood costs.

Research was carried out in three areas of water resources in Minnesota: flood control, navigation, and general water policies. Research results indicate that governmental units were the ultimate bearers of nearly half of the flood costs in the Minnesota River Basin in the 1965 and 1969 floods. An incidence of costs analysis provides justification for the imposition of land-use restrictions in flood plains. Vigorous enforcement of the Minnesota 1969 Flood Plain Management Act which stresses non-structural solutions to flood problems is recommended. The current issues in commercial navigation which affect Minnesota basically involve a resolution of the conflict between developmental and environmental values; such is the issue of dredging to maintain the 9-foot navigation chan-nel on the Upper Mississippi River. Without mainner on the Opper Mississippi River. Without main-tenance dredging, barge traffic would come to a halt on the Upper Mississippi causing irreparable economic harm. The Corps' present method of dredging and depositing of dredge spoil causes irreparable environmental damage by blocking the flow of backwater sloughs. However, the Corps is not ready to accept full responsibility for closure of these sloughs on the Upper Mississippi River. A possible alternative is for users of the 9-foot navigation channel to be required to pay the full costs of environmentally sound dredge spoil disposal. With a system of user charges in effect, environmental values would be better accounted for and barge transportation will be assigned to its most efficient position in the national transporta-tion system. (Walton-Minnesota) W74-12206

WATER RESOURCE AND HAZARD PLANNING REPORT FOR THE CLARK FORK RIVER VAL-LEY ABOVE MISSOULA, MISSOULA COUN-TY, MONTANA.

Montana Univ., Missoula. Dept. of Geology R. J. Wheeler.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22161 as PB-236 041, S4.00 in paper copy, S2.25 in microfiche. Montana University Joint Water Resources Research Center, Bozeman, Completion Report No 51, July 1974, 75 p. 10 fig. 4 tab, 19 ref, 3 append. OWRT A-065MONT(1), 14-31-0001-3826.

Descriptors: *Flood plains, *River basin development, *Montana, *Water table, *Seismic waves, *Water level fluctuations, Aerial photography, *Planning. Flood frequency Identifiers: *Clark Fork River(Mont).

A 33-mile reach of the Clark Fork River east of Missoula, Montana, was the subject of a two-year hydrology and flood hazard study. The 100-year flood plain was delineated by a unique method in-corporating aerial photographs obtained during a flood of known recurrence interval, and synthesized rating curves developed for several sites in the reach. The maps, which were developed at a cost of \$120 per river mile, are believed to be nearly as accurate as maps obtained by more so-phisticated and costly techniques. Water levels in 20 wells were monitored during a one-year period to determine piezometric surfaces and water table fluctuations. Gravity traverses were made to determine bedrock configurations and depths to bedrock. The seismic refraction method was used for calibration of depth calculations. (Williams Montana State) W74-12360

Group 6F-Nonstructural Alternatives

SOCIAL DIMENSIONS OF URBAN FLOOD CONTROL DECISIONS,

Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.

W. H. Andrews, and D. C. Geertsen. Available from the National Technical Informa-Avauable from the National Technical Information Service, Springfield, Va 22161 as PB-236 037, \$3.75 in paper copy, \$2.25 in microfiche. Research Monograph No. 3, January 1974. 69 p, 5 fig, 22 tab, 42 ref, append. OWRT A-010-UTAH(2). 14-31-0001-3845.

Descriptors: *Flood control, *Decision making, Aesthetics, *Attitudes, Social values, Social aspects, Management.

Identifiers: *Social variables, *Urban flood control.

An exploratory study of the social variables that are likely to be important in making public decisions about controlling flood waters of local streams was made. In addition to discovery of social factors the objectives included description and measurement of attitudes, needs and actions related to the decision problem as well as analysis of certain institutional constraints or organizational problems of government agencies affecting the drainage decision process. Social factors identified related to several areas including flooding experience, awareness and information, level of concern, attitudes about flood management attitudes toward and knowledge about specific proposals, social participation, aesthetic, leisure and environmental measures and demographic characteristics. Numerous federal, state and local agencies are involved in flood control activities, some more directly than others. Central responsibility was mainly with the county and the Army Corps of Engineers. There was a high degree of interrelatedness among these agencies as well as conflicting differences. Home ownership, location of re-sidence, length of residence, higher education and male sex were factors associated with higher awareness. W74-12369

FLOOD PLAIN INFORMATION: KINGSLAND CREEK, CHESTERFIELD COUNTY, GINIA.

Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W74-12393

FLOOD PLAIN INFORMATION: OLDTOWN CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA, Army Engineers District, Norfolk, Va.

For primary bibliographic entry see Field 4A. W74-12394

FLOOD PLAIN INFORMATION: MAUMEE AND AUGLAIZE RIVERS, DEFIANCE, OHIO, Army Engineers District, Detroit, Mich. For primary bibliographic entry see Field 4A.

A PLAN FOR MICHIGAN'S SHORELANDS. Michigan Dept. of Natural Resources, Lansing. For primary bibliographic entry see Field 6E.

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL IMPACT ANALYSIS: THE EXAMPLE OF THE PROPOSED TRANSALASKA PIPELINE, Geological Survey, Washington, D.C.

Circular 695, 1974. 16 p, 3 fig, 8 ref.

Descriptors: *Alaska, *Oil fields, *Pipelines, *Environment, Environmental engineering, Planning, Frail lands, Social aspects, Economics. *Environmental impact analysis, Trans-Alaska pipeline.

The environmental impact analysis made as required by the National Environmental Policy Act of 1969 for the proposed trans-Alaska pipeline included consideration of the (1) technologically complex and geographically extensive proposed project, (2) extremely different physical environ-ments across Alaska along the proposed route and elsewhere in Alaska and in Canada along alternative routes, (3) socioeconomic environment of the State of Alaska, and (4) a wide variety of alterna-The environment was divided into two general parts--natural physical systems and supergeneral parts-natural physical systems and super-posed socioeconomic systems-and those parts were further divided into discipline-oriented systems or components that were studied and analyzed by scientistis of the appropriate discipline. Particular attention was given to poten-tial feedback loops in the impact network and to linkages between the project's impacting effects and the environment. The principal unavoidable effects would be (1) disturbances of terrain, fish and wildlife habitat, and human environs, (2) the results of the discharge of effluent from the tanker-ballast-treatment facility into Port Valdez and of some indeterminate amount of oil released into the ocean from tank-cleaning operations at sea, and (3) the results associated with increased human pressures of all kinds on the environment. Comparison of alternative routes and transportasystems and of their environmental impacts provided information which indicates that one corridor containing both oil and gas pipelines would have less environmental impact than would separate corridors. (Knapp-USGS) W74-12011

IMPACT OF RECENT ECONOMIC GROWTH AND INDUSTRIAL DEVELOPMENT ON THE ECOLOGY OF NORTHWEST MIRAMICHI AT-LANTIC SALMON (SALMO SALAR), Fisheries Research Board of Canada, St. Andrews

(New Brunswick). Biological Station For primary bibliographic entry see Field 5C.

ECOSYSTEM MODELING OF A FORESTED RIVER BASIN, Washington Univ., Seattle. Coll. of Forest

Resources. For primary bibliographic entry see Field 2A. W74-12294

FIELD TEST OF AN ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY, Georgia Inst. of Tech., Atlanta.

Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 045, \$5.75 in paper copy, \$2.25 in microfiche. Report No ERC-1574, August 1974. 203 p, 15 fig, 11 tab,

Descriptors: *Environmental effects, Ecology, Evaluation, Aesthetics, Value, *Ecosystem, *Water quality, Air quality, *Land use, *Social aspects, Social impact. Identifiers: *Environmental impacts, Noise.

The part of the National Environmental Policy Act of 1969 (NEPA), Public Law 91-190, which has received the most attention has been Section 102(2) (c), requiring the preparation 'Environmental Impact Statements' for Federally funded construction that may adversely affect the environment. In response to this requirement, many agencies have attempted to prepare methodologies for impact assessment. A field application is described of an environmental impact assessment methodology designed by Bat-

telle Memorial Institute (Columbus Laboratories) for the Georgia Department of Transportation to one rail line of the planned Metropolitan Atlanta rapid transit system. The methodology, among the most rigourous and explicit of the available impact evaluation techniques, utilizes a number of value functions for converting information on a wide variety of dissimilar environmental effects to commensurable quantitative units. The conversion permits aggregation and evaluation of overall environmental impact and of tradeoffs among in-dividual effects. Alternate value functions can be readily explored, and new ones can be added as desired. The methodology includes (1) a comprehensive checklist of 68 environmental factors, (2) a method for measuring the impact magnitude for each factor, and (3) value functions for weighing the importance of diverse impacts. a critical evaluation of the validity and usefulness of the method for incorporating environmental concerns into the planning-decision process shows one of the biggest problems to be prediction of the one on the biggest problems to be prediction of the environmental conditions without the project. Several existing environmental assessment techniques are reviewed. (James-Georgia Tech) W74-12357

PROCEEDINGS OF THE XV EUCEPA CON-FERENCE ON HARMONIZING PULP AND PAPER INDUSTRY WITH ENVIRONMENT, or primary bibliographic entry see Field 5G. W74-12400

TECHNICAL REPORT FROM THE STOCKHOLM UN CONFERENCE, Swedish Water and Air Pollution Research Lab.,

Stockholm. S. Freyschuss.

In: Proceedings XV EUCEPA Conference on Harmonizing Pulp and Paper Industry with Environ-ment; held in Rome, May 7 to 11, 1973, p 37-42,

Descriptors: *Conferences, *United Nations, Descriptors: "Conferences, "United Nations, "Organizations, *Environmental control, 'Water pollution, *Air pollution, Water pollution control, Pollution abatement, Regulation, Legislation, Governments, Coordination, Cooperatives, Human resources, Ecology, Project planning, In-ternational Commirciations ternational Commissions

Representatives of 113 nations, 16 interstate agencies, and about 250 international societies attended the United Nations Conference on the Human Environment, held June 5-16, 1972, which was concerned with global ecological problems. A major outcome was the adoption of a declaration on the human environment, embodying 26 guideline prin-ciples and 106 recommendations directed at national governments and international agencies regarding actions against further pollution of natural garding actions against turner politicition of natural waters and the atmosphere. As a corollary, an environmental secretariat was established with headquarters in Nairobi for initiation and coordination of U.N. antipollution programs. (See also W74-12400) (Brown-IPC) W74-12401

SURVEY OF ENVIRONMENTAL LEGISLA-TION IN THE GERMAN FEDERAL REPUBLIC (UEBERSICHT UEBER DIE UMWELTGESETZ-GEBUNG IN DEUTSCHLAND), DER BUNDESREPUBLIK

Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle. For primary bibliographic entry see Field 6E. W74-12402

FRENCH LEGISLATION AND POLICIES RE-GARDING ENVIRONMENTAL PROTECTION (LEGISLATION ET POLITIQUE FRANCAISES EN MATIERE DE PROTECTION DE L'ENVIRONNEMENT), Societe Aussedat-Rey, Saillat (France). For primary bibliographic entry see Field 6E.

W74-12403

LEGISLATION ON ENVIRONMENTAL PRO-TECTION IN SCANDINAVIA, National Water Board of Finland, Helsinki

For primary bibliographic entry see Field 6E. W74-12404

CANADA'S APPROACH TO ENVIRONMENTAL POLLUTION CONTROL FOR THE PULP AND PAPER INDUSTRY,

Environmental Protection Service. Ottawa (Ontario).

For primary bibliographic entry see Field 5G. W74-12405

FINAL CONFERENCE REPORT FOR THE NA-TIONAL CONFERENCE ON MANAGING THE ENVIRONMENT.

Available from the National Technical Informa tion Service, Springfield, Va 22161 as PB-227 033, \$16.50 in paper copy; \$2.25 in microfiche. Environmental Protection Agency, Washington, D.C., Office of Research and Development, (1974), 269 p.

*Environment. *Management. Descriptors: *Comprehensive planning, *Pollution, Ecology, Decision making, *Legal aspects, Local governments, State governments, Federal government, *Institutional constraints, *Intergovernmental relations

Identifiers: Environmental quality.

The National Conference on Managing the Environment was held on May 14 and 15, 1973, in Washington, D.C. Approximately 350 persons, predominantly public officials of all levels of government, attended the discussions of various aspects of environmental management. The con-ference sessions covered the following topics: the environment--how comprehensive; interaction at the local level; a decision maker faces the environment; local government experience; regional government experience; legal and judicial constraints; public involvement; environmental technology; growth; standards; comprehensive planning; intergovernmental relations; and four technical workshops. The conference was spon-sored by the Environmental Studies Division, Washington Environmental Research Center, U.S. Environmental Protection Agency. (See also W74-12458 thru W74-12478) W74-12457

BEYOND THE BRUSHFIRES.

Environmental Protection Agency, Washington,

Final Conference Report for the Environmental Protection Agency, Washington, D.C. National Conference on Managing the Environment, p 1:4-1:7, 1974.

Descriptors: *Environmental control, *Air pollution, *Water pollution, *Comprehensive planning, *Operations research, Technology, Simulation analysis, Planning, Regulation, Social aspects, Systems analysis, Land use, Ecology.

Many environmental problems now dealt with on an emergency basis could have been predicted and resolved long ago. Automobile pollution projections could have been made in the 1950's. The information necessary to develop systems solutions to many ecological problems is available now. The situation in San Diego is illustrative. In 1971, 158,000 tons of volatile organic compounds were vaporized into the atmosphere. Regulations to minimize loss of gasoline created at transfer points were put into effect. Technology existed to minimize the vaporization. As a result, the county of San Diego will annually save 6.15 million gal-lons, which will more than pay the technology costs. Certain steps must be taken to insure optimum application of existing technical knowledge. Local governments must acquire a new level of expertise in areas like operations analysis, airshed models, land planning, and traffic simulation. Al-liances must be formed in areas where environ-mental problems overlap jurisdictional lines. Diverse local agencies must be united for a coordinated effort on paoblems which do not have piecemeal solutions. Most importantly, the traditional American concept of growth will have to be reexamined. We will have to make do with less energy, smaller cars, and more personal restraints. will realize our fundamental dependence on the biological world, and the necessity of stability in its maintenance. (See also W74-12457) its maintenance. (See also (LaPointe-North Carolina) W74-12458

MANAGEMENT FOR THE FUTURE,

Council on Environmental Quality, Washington,

Final Conference Report for the National Conference on Managing the Environment Environmental Protection Agency, Washington, D.C., p I-8-I-12, 1974

Descriptors: *Administration, *Decision making, *Management, *Monitoring, *Environmental control, *Environmental effects, Optimization, Technology, Ecology, Systems analysis, Alterna-

tive planning.
Identifiers: "National Environmental Protection
Act(NEPA), *Public participation, Environmental
Impact Statement(EIS).

An effective management system must possess two key elements: (1) the best information and feedback for decision making; and (2) follow-up decisions and tasks. Two essential information inputs to environmental decision making are monitoring and improvement of the data base, and citizen participation. Good monitoring data, in easily understandable forms, assures optimum achievement of goals. Further research is required in determining the health effects of pollutants, and economic and social impacts of various regulatory systems. Monitoring should go beyond the direct determination of pollutant concentrations to fish, wildlife, forests, and soils. The single most important input to the environmental management process is citizen participation, which the National Environmental Protection Act has sought to maximize. By open discussion of the alternatives with the public, a broader range of alternatives is made available. Goal setting must be carried out in full public view if confidence in the goals is to be assured. The environmental impact analysis has created a magnificent tool for furthering public comment. This analysis not only requires the presentation and elaboration of alternatives, but provides for multidisciplinary discussion which is essential to the resolution of complex problems Another important reason for furthering public participation is to discourage the feelings of alienation and inevitability that the average citizen has as the complexity of problems increases. (See also W74-12457) (LaPointe-North Carolina) W74-12459

THE ECONOMICS OF ECOLOGY,

Colorado Univ., Boulder. K. E. Boulding

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p II:13 - II:17, 1974.

Descriptors: *Economics, *Ecology, *Speciation, Niches, *Population, *Limiting factors, Competition, Goods, Ecosystems, Environment, Economic impact, Economic efficiency, Wastes, Equilibrium, Social aspects, Social values, Constraints, Trade associations.

The economic subsystem is a subset of the human social system and therefore of the total ecological system. Many material economic entities, such as automobiles and dollar bills, can be viewed as ecologic species in that they require both materials for growth (production), energy for mobility (fuel or muscular energy), and produce excretions (gaseous combustion products from automobiles). Because man possesses a nervous system which assimilates large quantities of knowledge and a mental faculty for analysis, he has an unusual capacity for cooperation with his own artifacts (wheat, machines, clothing, automobiles, etc.) with consequent continued expansion of the human niche and increased population growth. Humans compete with other species for a share in the total ecosystem. Almost all human economic the total ecosystem. Almost all numan economic activity produces both 'goods' and 'bads'. Beef production means polluting feedlots; power production, polluting power plants. The major problem is in insuring that private decisions which hope to maximize private benefits, also produce public benefits. Many current ecological problems, like wilderness preservation, cannot be resolved by reliance on the private marketplace. The question of how much further the human race can expand its ecological niche is dependent upon the type of economic and social structure basic energy source, necessities, life styles), which can be sustained. The study of ecology can point out the limitations that the human niche does have at some point in time, in order to insure a stable and reasonably agreeable spaceship earth. (See also W74-12457) (LaPointe-North Carolina) W74-12460

PLANNING FOR QUALITY GROWTH, Hawaii State Dept. of Planning and Economic Development, Honolulu. S. M. Mark.

Final Conference Report for the National Conference on Managing the Environment, Environ-mental Protection Agency, Washington, D.C., p. II:18-II:25, 1974.

Descriptors: *Land use, *Planning, *Hawaii. *Legislation, State governments, State jurisdic-tion, Environment, Land resources, Land classification, Land development, Federal government. Physical control.

Identifiers: *National Land Use Policy Act, *New

The State of Hawaii passed a land use law in 1961 providing for classification of all public and private lands as urban, rural, agricultural or conservation, with a reclassification every five years. and assignment of the land uses permitted under each classification. As a result land speculation and scattered development have been greatly reduced and prime agricultural and conservation lands have been preserved. The Hawaiian ex-perience offers many insights to states now embarking on land use programs of their own, and will be a helpful example when after passage of the National Land Use Policy Act, states are forced to undertake comprehensive planning. Much of the burden of defining specific goals and creating relevant organizational structures will be borne by the states with the incentive of federal funding. In the interim, before a national act is passed, states should develop their own planning capabilities and sort out the complex local jurisdictional problems that have historically impeded rational environmental management. Whereas environmental planning has centered around physical and spatial concerns, and economic and population questions. now focus must shift to 'quality growth,' or total environmental quality, encompassing social as well as economic criteria. A workable definition for quality growth, reflecting the proper balance of economic, social and environmental objectives, together with criteria for measuring such growth togener with criteria for measuring such growth and methods for including public participation in the discussion now need urgent development by state planning councils. (See also W74-12457) (LaPointe-North Carolina)

Group 6G-Ecologic Impact Of Water Development

ENVIRONMENTAL DECISION MAKING.

Final Conference Report for the National Con-ference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. II:26-II:31. 1974.

Descriptors: *Land use,
*Decision making,
*Loc *Environment, *Planning, *Decision making, Administration, *Arizona, Project planning, *Local governments, Zoning, City planning, Land classification, Land resources, Irrigation, Sewage effluents, Landfills, Recreation.
Identifiers: *Open space, *Phoenix(Ariz).

The goal of environmental management is defined as the creation and maintenance of a productive harmony between man and his environment. Productive harmony implies a balance between the quality of the surroundings and economic costs of that quality. Phoenix is taking positive steps to achieve this. In July, 1971, the City Council established a 21 member ongoing Environmental Quality Commission to identify problems and propose solutions, and aided by an environmental planner, many changes have already taken place at the local level. Hillside ordinances have been adopted to reduce density, visual pollution of signs is being heavily reduced, and backup treatment is now required for residential development insuring no more bleak backwalls along major streets. Tree planting programs are underway mostly in inner city areas and a major thrust is being directed to a new open space program including outlay of \$40 million to buy the Phoenix Mountains in the central city, the land to be kept in its natural state to prevent dangerous development along the mountainsides. Various landfill projects together with the purchase of private lands will create parks. EPA is financing a study of converting Phoenix sewage plant effluent to a quality sufficient to use as truck farm irrigation, and another portion of sewage will cool a nuclear reactor now under construction. Environmental impacts of all projects must be determined prior to construction, how-ever a more objective cost-benefit analysis is needed. (See also W74-12457) (LaPointe-North Carolina)

INCREMENTALISM AND ENVIRONMENTAL-

ISM.

Yale Univ., New Haven, Conn.

W74-12462

C. Lindblom.
Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. II:32-II:34. 1974.

*Planning, Descriptors *Comprehensive planning, Alternate planning, Long term planning, Environment, Decision making, Social change. Identifiers: *Incrementalism, *Selective planning.

The goal of comprehensive planning is an almost universally accepted axiom. However, such planning is by its very nature doomed to frustra-tion and failure. Complexities of current problems which are cited as reasons for comprehensive planning serve only to limit the completeness or broadness of planning. The planner will never have enough information or the breadth of expertise to develop a comprehensive plan. Rather a selective approach to planning emphasizing discrimination, strategy, and flexibility in the face of errors must be developed. This would allow the decision maker room to maneuver, room to attack a particular problem from a high focus, and then to pull back and weigh new information gained in order to continue the attack. Broad planning practices can be hampered by the desire to apply the scientific method which is designed for mastering a narrow, well defined problem ignoring interre-lated variables; reliance on conceptualization rather than the more painstaking selective ap-proach; the conventional wisdom that we arrived at our environmental difficulties piecemeal and only some other method will extricate us (an idea strongly rejected); and the argument that only all-encompassing solutions are viable. (See also W74-12457) (LaPointe-North Carolina) W74-12463

THE POSITIVE ROLE OF ENVIRONMENTAL

MANAGEMENT, Indiana Univ., Bloomington. Dept. of Political Science; and Indiana Univ., Bloomington. Dept. of Public and Environmental Affairs. L. K. Caldwell.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. III:19-III:24, 1974.

Descriptors: *Environment, *Environmental effects, *Environmental control, *Administration, *Legislation, Land use, Planning, Pollution abatement, Federal government, Urban renewal, State government, Federal jurisdiction.

The public outcry for environmental enhancement in the 1960's spurred the formation of the Environmental Protection Agency and The Council on Environmental Quality, together with a variety of state and local agencies. While there have been some improvements, measures taken thus far have been mostly of a stopgap nature designed to prevent further environmental degradation and to preserve some land areas. The major task of restoring damage already inflicted upon the en-vironment has not been addressed. The establishment of an Environmental Reconstruction Agency to pursue this goal is proposed. This agency would be a coherent system capable of deploying knowledge, manpower, and money in assisting local citizenry in fully analyzing environmental options. Especially critical areas could receive a national focus, e.g. the Southern Appalachians, the arid Southwest, and many inner cities. The agency and southwest, and many inner cities. The agency would be responsible for restoring derelict land, the removal of decayed structures from urban areas, and the grouping of small settlements into more viable communities. The expertise of the Corps of Engineers could be enlisted. An initial budget might be of the order of \$10 billion, with a brouget might be of the order of \$10 billion, with a like amount generated from local and state funds. Enactment of a national land use policy act would be a necessary forerunner of such an agency. (See also W74-12457) (LaPointe-North Carolina) W74-12464

STATE GOVERNMENTS TACKLE POLLU-

TION, Woodrow Wilson International Center for Scholars, Washington, D.C. F. H. Haskell.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. III:25-III:33. 1974. 2 fig.

Descriptors: *State governments, *State jurisdiction, *Consolidation, *Administrative agencies, *Governmental interrelations, *Environmental control, Land use, Legal aspects, Water resources development, Water quality control, Reviews, Pollution abatement, Solid wastes, Adoption of

Identifiers: Illinois Environmental Protection Act of 1970, Maryland Environmental Service, Class action lawsuits.

Many state governments are moving dramatically to develop the implementation capabilities they will need to carry out federally or state mandated environmental protection programs. Such governments are responding in a variety of ways from reorganizing old agencies to developing new ones. The most prevalent change has been the relocation of the many environmental functions of state government from scattered agencies into one com-prehensive organization. Illinois, Minnesota, Wisconsin, Washington, and New York are some

examples of this approach. Pollution control is the major focus of these new agencies. In many states the environmental department is overseen by an interagency or civilian board. These attempts at consolidation hopefully will allow for more comprehensive planning, minimize duplication, maximize efficiency, vocally advocate environmental issues, and build a stronger political base for environmental protection. Many of the myriad partitime review boards, which rule on environmental issues, are now full-time and equipped with staff, some have been phased out in favor of one administrator, and some are subject to the veto of an environmental commission. Some states have taken on entirely new functions in order to address environmental problems. Vermont and Maine have established land use control systems requir-ing permits to build or develop land. In Vermont this function is administered by the Agency of En-vironmental Conservation. The new Maryland Environmental Service has the authority to construct and operate waste treatment facilities previously a function solely under the direction of local governments. Class action lawsuits by private citizens have been authorized in Michigan and are under consideration in many other states. (See also W74-12457) (LaPointe-North Carolina)

REGIONAL ENVIRONMENTAL MANAGE-MENT AND THE DECISION MAKING PROCESS,

San Diego County, Integrated Regional Environ-mental Management Project, Calif.

Final Conference Report for the National Con-Final Conference Report for the Pattorna Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. III:34-III:42. 1974. 3 fig.

Descriptors: *Regional development, *Regional analysis, *Decision making, *Economic impact, *Environmental management, Cost comparisons, Computer models, Carrying capacity, Planning, Short term planning, Long term planning, Land use. Local governments.

Identifiers: Environmental Impact Report, Integrated Regional Environmental Management Board(IREM).

Of the various levels of governmental agencies, those at the local level have undergone the least reorganization and been the least apt to apply new environmental management techniques. Because environmental problems lend themselves more to regional than local solutions, there has been considerable difficulty in determining by whom and how decisions are to be implemented and en-forced. This has been complicated by the emergence of land use planning and transportation planning as major strategies replacing traditional abatement policies. Added to this is the conflict between the incremental decisions made in local situations and the regional planning process which is comprehensive and general. In order to equip themselves with the capabilities of responsibly managing the environment, local and regional agencies must develop a more incremental planning process, and this process must include land use considerations. The Environmental Im-pact Report, and permit systems such as those outlined in the California Coastal Zone Conservation Act are models of some of the elements of such a Act are models of some of the elements of such a process. San Diego has developed a computer model incorporating both the environmental and economic impacts of proposed projects, which is being tested in four local developments. In addition, a computerized early warning system and an Environmental Review Board overseeing impact report preparation have been established. Refinements to the computer models will include data on the carrying capacity (optimum population) of San Diego County. Also an ideal index diagram of standardized format, incorporating all relevant en-vironmental, economic, and social information is being evaluated. (See also W74-12457) (LaPointe-North Carolina) W74-12466

A DESCRIPTION OF THE ENVIRONMENTAL PLANNING AND MANAGEMENT PROJECT,

Metropolitan Government of Nashville Davidson County, Tenn. D. Battle.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. III:43-III:47. 1974.

Descriptors: "Environmental management, *Environmental control, *Planning, *Water quality control, *Priorities, Landfills, Land use, Solid wastes, Public benefits, Energy, Electric power, Electric power production, Conferences, Communication, Community development, *Tennessee. Identifiers: Davidson County(Tenn), Environmental Description, Environmental Description, Environmental Description, Environmental Pressure and Management tal planning, Environmental Planning and Manage-ment Project(EPMP), Nashville(Tenn).

In 1963 Davidson County incorporated the city of Nashville, and the smaller surrounding communiinto one Metropolitan District with a centralized Metropolitan Government. Two service areas were defined, one of high density defined by the city limits of Nashville, one one comprising the en-tire 533 square miles of the county. In 1972, financed by a private grant, the Metropolitan Government established the Environmental Planning and Management Project (EPMP). Its objectives were to define environmental problems, establish priorities for their resolution, and develop within the local agencies the expertise necessary for their resolution. The EPMP consisted of representatives from the local government, the business community, and the academic community, and is designed to coordinate the varying interests and concerns of these three varying interests and concerns of these three groups. Highest priority was given to the water quality degradation occasioned by the local meat packing industry, which generates 1/2-3/4 of the waste capacity of the already overloaded sewage treatment plant. Considerable improvement has been observed without noticeable economic damage. Another project undertaken was the study of a landfill on a diked flood plain. This yielded information on filling techniques, and showed no river pollution from the present methods. Even though Nashville will soon be using 720 of the daily 1200 tons of solid waste generated as fuel in a thermal transfer plant, the generated as fuel in a thermal transfer plant, the solid waste problem will continue to be very serious, and a minimum of 100 acres is currently needed for immediate use. (See also W74-12457) (LaPointe-North Carolina) W74-12467

IMPLEMENTATION OF CITIZEN PARTICIPA-TION IN THE MUNICIPAL PROCESS,

Environmental Protection Agency, Washington, D.C. Technical Assistance Research Programs. J. Goodman, J. Falkson, B. Mertens, and L.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. IV:10-IV:16. 1974. 8 ref.

Descriptors: *Federal Water Pollution Control Act, *Conferences, *Public rights, *Decision mak-ing, Planning. Identifiers: *Citizen participation, *Public

Identifiers: *Citizen participation, *Public hearings, *Implementation, Advisory boards, Workshops, Municipal process.

The Federal Water Pollution Control Act stinulated that public participation should be provided for and encouraged prior to acceptance of a plan; i.e. local citizenry must be involved in goal setting and implementation procedures. Unless public participation is developed in a way allowing sub-stantive input and a feeling of public satisfaction, can result, culminating in political or legal conflict causing long expensive project delays. Mechanisms of public participation with the most widespread use are: (1) Public hearings, which often do not offer an opportunity of feedback from the decision maker to the public revealing the impact the hearing has had on the decision; (2) Advisory boards, serving as a communication bridge between officials and townspeople, and which may be hampered by members who lack the expertise necessary to evaluate technical information. Further, officials may be reluctant to accept the board's advice; (3) Workshops can be used to complement either hearings or advisory boards should be organized around a particular project. Separate sessions for citizens and city offi-cials should be held prior to joint sessions. Citizen workshops should focus on legal requirements, project details, and analysis of case studies pertinent to possible action. Planner workshops should emphasize implementation of participation, publicity for meetings and hearings, and previous case studies of citizen participation. Proper timing is essential; the public must be consulted prior to the decision making, if conflict is to be reduced and planning efficiency increased. (See also W74-12457) (LaPointe-North Carolina)

THE CONCEPT OF CARRYING CAPACITY, Utah State Univ., Logan. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 6B. W74-12469

FIXED VERSUS VARIABLE ENVIRONMENTAL STANDARDS, MITRE Corp., McLean, Va.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. V:38-V:57, 1974, 2 fig. 4 tab, 27 ref.

Descriptors: *Environmental control, *Standards, *Variability, Administrative costs, State jurisdiction, Environmental effects, Fuels, Electric power production, Air pollution, Coals, Sulfur, Air pollution effects, Radiation, Economic impact, Social

Identifiers: Fixed environmental standards, Variable environmental standards, Enforcement strate-

While both water and air standards require a fixed time interval, attaining such standards can result in implementation procedures which allow great variation in enforcement. Actually today only the ambient air quality standards and the mobile source emission standards may be truly regarded as fixed. Variable standards have their basis in the variation of a number of factors which affect pollutant emission and the assimilative capacity of the environment. Such parameters include time, which is usually fixed by law; space (different geographical areas); source categories; individual emitters within source categories; and the use of resource receiving the waste. The latter parameter is especially important in the case of water stan-dards with different uses requiring widely varying water quality. In order to meet the Ambient Air Quality standards, a number of states have em-ployed variable controls in their implementation plans. Some objections to variable standards are the economic inequalities which would ensue if manufacturers of like commodities face different control costs, the high administrative costs of variable controls, and the administrative difficulty in the production of different products (e.g. automobiles) for use in different geographical areas. However the economic benefits and flexibility provided by variable controls might represent a greater overall benefit. For example, standards which considered time variations of assimilative capacity based on meteorologic changes would allow for more efficient allocation of low sulfur coal. High emission standards on major polluters might give a lower total cost solution than equalized emission standards on all polluters. (See W74-12457) (LaPointe-North Carolina)

ENFORCING ENVIRONMENTAL LAW IN THE

CITY,
New York City Corporation Counsel.
For primary bibliographic entry see Field 6E.
W74-12471

THE STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM (SEAS): A RESEARCH PRO-

Environmental Protection Agency, Washington,

For primary bibliographic entry see Field 6B. W74-12472

THE DEVELOPMENT AND OPERATION OF A PROTOTYPE STATE ENVIRONMENTAL INFORMATION CENTER,

East Central State College, Ada, Okla. Environ-mental Information and Media Center. For primary bibliographic entry see Field 10D. W74-12473

COMMUNICATIONS IN ENVIRONMENTAL

MANAGEMENT, Metropolitan Regional Council, Inc., New York. For primary bibliographic entry see Field 6B. W74-12474

STATE RESPONSIBILITY IN MANAGING THE ENVIRONMENT.

Connecticut Dept. of Environmental Protection, Hartford For primary bibliographic entry see Field 6E.

HOW A REGIONAL ORGANIZATION AS-SUMES ENVIRONMENTAL RESPONSIBILITY, Metropolitan Council of the Twin Cities Area,

For primary bibliographic entry see Field 6E. W74-12476

THE COOPERATIVE APPROACH TO EN-VIRONMENTAL ENHANCEMENT,

State Univ. of New York, Albany J. F. Zimmerman.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. VII:19-VII:39, 1974, 9 tab, 14 ref.

Descriptors: *Environmental management, *Local governments, "Political aspects, "Regional development, "Water resources, Adoption of practices, Water management(Applied), Legal aspects, Economies of scale, Economic efficiency, Contract, Contract administration, Govern-mental interrelations. Identifiers: Service agreements, Opinion poll.

Service agreements which exploit economies of scale between local and/or county governments have become much more popular in the past 25 years, mainly due to easing of statutory restrictions and recent state incentives established to encourage cooperation between governments. The regional character of environmental management should increase emphasis on service agreements. A written questionnaire, designed to ascertain the extent of an attitudes toward service agreements, has 2375 municipalities responding out of a possible 5900. Conclusions were that 60% of the governments engage in such agreements, with only one service usually involved, and that councilmanager governments enter into service agreements more frequently than other forms of mu-nicipal administration. Widespread and successful use of multi-lateral service agreements as deter-mined by a metropolitan planning commission, council of governments or the state may create additional problems. First, expanded use could add to the burden of complexity already harassing

Group 6G-Ecologic Impact Of Water Development

local governments. Secondly, service agreements could strengthen the fragmented governmental system and further encourage the fiscal disparity between nonviable, tax benefiting 'paper' commu nities and larger tax poor urban areas. Service may, in the end, only serve to impede the formation of metropolitan government and act as a stopgap measure for resolving major problems. This could lead to increased pressure for federal and state government action. (See also W74-12457) (LaPointe-North Carolina) W74-12477

MANAGING AT THE LOCAL LEVEL,

International City Management Association, Washington, D.C.

For primary bibliographic entry see Field 6B.

BEECH CREEK, MT. VERNON, OREGON, FLOOD CONTROL CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT). Army Engineer District, Walla Walla, Wash. For primary bibliographic entry see Field 4A. W74-12599

OSWEGO STEAM STATION, UNIT 6, NIAGARA MOHAWK POWER CORPORA-TION, OSWEGO HARBOR, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATE-MENT).

Army Engineer District, Buffalo, N.Y Available from the National Technical Information Service, Springfield, Va 22161 as EIS-NY-73-0895-F; \$16.25 in paper copy; \$2.25 in microfiche. March 29, 1973. 284 p, 54 fig, 37 tab.

Descriptors: *Environmental effects, *Electric power production, *Steam turbines, *Water pollupower production, *Steam turbines, *Water pollution, *Electric generators, Electric power, Steam, Stations, Thermal power, Thermal water, Thermal pollution, Federal government, Administrative agencies, Water pollution sources, Air pollution, Water temperature, Fuels, Oil, *New York, Generators, Lake Ontario, Electric power demand, Power operation and maintenance, Ecosystems, Pollution.

Identifiers: *Environmental Impact Statements, *Oswego(NY), National Environmental Policy Statement.

Statement

The project proposes the construction of a sixth oil-fueled steam electric generating unit with intake and discharge structures, and other appurtenances. The Oswego Steam Station is located on 91 acres of land in Oswego, New York, on the shores of Lake Ontario. The new unit is necessary to meet New York's increasing power supply demands. The environmental impacts include occupation of ten acres of land, discharge of quantities of heat, air-borne emissions, liquid effluents, and sound energy as well as receipt and consumption of 9 million barrels of fuel oil per year. These are all adverse effects to some degree. Alternatives are no action, location elsewhere, purchase of power, hydroelectric instead of steam electric generation, use of other fuels or use of other cooling systems to minimize thermal pollution. The present proposal is less expensive, more efficient and minimizes deleterious effects to the environment. Irretrievable commitments include labor, materials and fuel consumption. Comments from government and citizen groups were received and considered. (Dillingham-Florida) W74-12600

BAKER LAKE WATERSHED PROJECT, FAL-LON COUNTY, MONTANA (FINAL ENVIRON-MENTAL IMPACT STATEMENT). Soil Conservation Service, Bozeman, Mont.

For primary bibliographic entry see Field 4A. W74-12601

WATER BANK ACT--REPORT.
Committee on Agriculture and Forestry (U.S. Senate).

For primary bibliographic entry see Field 6E. W74-12610

SURVEY OF ENVIRONMENTAL LEGISLA-TION.

TION, A. C. Jacobson. University of Miami Law Review, Vol 26, No 4, p 778-803, Summer 1972. 276 ref.

Descriptors: *Florida, *Legislation, *Political aspects. *Environmental sanitation, *Federal aspects, *Environmental sanitation, *Federal government, Government finance, Oil industry, Oily wastes, Social aspects, Measurement, Wildlife conservation, Water pollution control, Conservation, Coordination, Ecology, Water resources development, Water law, Administra-tion, Statutes, Institutional constraints, Planning, Recreation demand, Industrial waste, Aesthetics, Environmental effects.
Identifiers: *Coastal zone management.

Legislation in the Florida Statutes dealing with the environment is described. The legislation passed in 1970 and 1971 reflected the growing concern for the public for protective measures. Some concern has stemmed from damaging oil spills that have oc-curred in recent years. In 1970 and Oil Spill Prevention and Pollution Control Act as well as Prevention and Poliution Control Act as well as the State Wilderness System Act was passed. The Florida Litter Law of 1971, the Environmental Protection Act of 1971, and chapters 71-203 and 71-36 represent some of the major legislative actions involving current environmental problems. The educational facilities of the state regarding environmental etudies received a become when five vironmental studies received a boost when five acres of spoil island were made available for a marine shore facility. It is necessary to work in conjunction with adjacent states as well as the federal government to attack common problem areas. If the legislature is responsive to the needs and demands of the public, then the increase in legislation also points out the awareness of the public to environmental needs. (Sperling-Florida) W74-12618

DEEPWATER PORTS.

For primary bibliographic entry see Field 6E. W74-12619

CORPS OF ENGINEERS DREDGE AND FILL JURISDICTION: BUTTRESSING A CITADEL **UNDER SIEGE**

For primary bibliographic entry see Field 5G. W74-12620

ENVIRONMENTAL DEFENSE FUND V, FROEHLKE (REQUIREMENTS FOR ENVIRON-MENTAL IMPACT STATEMENTS). For primary bibliographic entry see Field 6E. W74-12623

SOWASHEE CREEK WATERSHED, LAU-DERDALE COUNTY, MISSISSIPPI (FINAL EN-VIRONMENTAL IMPACT STATEMENT). Soil Conservation Service, Washington, D.C. For primary bibliographic entry see Field 4A. W74-12626

7. RESOURCES DATA

7A. Network Design

THE DESIGN OF RAINFALL NETWORKS IN TIME AND SPACE,

Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 2B. W74-12312

INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLI-CATIONS 2. ERROR ANALYSIS OF APPROXI-MATE THEORIES, Universidad Nacional Autonoma de Mexico, Mex-

ico City. Centro de Investigacion en Matematicas Aplicadas y Sistemas For primary bibliographic entry see Field 2F. W74-12333

7B. Data Acquition

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO USING ERTS-1 DATA: PROGRESS REPORT II.

Colorado School of Mines, Golden. Dept. of

Available from NTIS, Springfield, Va. 22161 as N73-27289, Price \$4.50 printed copy; \$2.25 microfiche. Progress Report for June 31-November 11, 1972 for Goddard Space Flight Center, December 1972. 43 p, 9 fig, 3 tab. NASA Contract NaS5-21778.

Descriptors: *Geologic mapping, *Remote sensing, *Satellites(Artificial), *Water resources, Mapping, Photogrammetry, Terrain analysis, Structural geology, *Colorado.

Preliminary geologic interpretations of ERTS-1 scenes in central and western Colorado indicate that lithologic discrimination and structural interpretation can be made on ERTS-I images. Generally, lithologic units are composed of 2 or more recognized geologic formations and should more correctly be referred to as remote sensing units. Faults mapped on ERTS-1 images in units. Faults mapped on ER15-1 images in western Colorado correspond well with faults mapped on the geologic map of Colorado (1:500,000). Stratigraphic offset was easily detected along faults as short as 3 km; faults as short as 1/2 km should be identifiable. Several previously unwapped major linear features, possibly ously unmapped major linear features, possibly faults, were detected and mapped. Stereoscopic analysis of ERTS-1 imagery greatly enhances the capability of the interpreter. Structural features and lithologic contacts are more accurately traced and more remote sensing units can be defined. Ambiguous or questionable structural interpreta-tions are commonly quickly resolved by stereo-scopic analysis. (Knapp-USGS) W74-12016

CHARACTERISTICS OF SEA ICE, LAKE ICE AND PERMAFROST USING AN IMPULSE RADAR SYSTEM,

Geophysical Survey Systems, Inc., Worth Billerica, Mass. For primary bibliographic entry see Field 2C. W74-12053

ERTS-1 APPLICATIONS IN HYDROLOGY AND WATER RESOURCES,

National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
V. V. Salomonson, and A. Rango.
Available from NTIS, Springfield, Va 22161 N73-

23468, Price \$3.25 printed copy; \$2.25 microfiche. NASA Technical Memorandum X-66237, May 1973. 24 p, 6 fig, 25 ref.

Descriptors: *Remote sensing, *Hydrologic data, *Telemetry, *Satellites(Artificial), Data collec-tions, Mapping, Surveys, Floods, Glaciers, Tur-bidity, Path of pollutants, Monitoring. Identifiers: ERTS.

The Earth Resources Technology Satellite (ERTS-1) provides very applicable data for effective monitoring and management of surface water features over the globe. Mapping flooded areas, snowcover, and wetlands and surveying the size, the same technology of the size of th type, and response of glaciers to climate are

among the specific areas where ERTS-1 data have among the specific areas where ERTS-I data have been applied. Turbidity variations in lakes and rivers have been observed and related to shoreline erosion, industrial plant effluent, and overall water quality. In addition the Data Collection System (DCS) is a reliable tool for gathering hydrologic data from remote regions. (Knapp-1963) USGS) W74-12062

ANALYSIS OF SOME METHODS FOR OBTAIN ING SEA SURFACE TEMPERATURE FROM SATELLITE OBSERVATIONS.

Goddard Space Flight Center. National Aeronau-tics and Space Administration, Greenbelt, Md. For primary bibliographic entry see Field 7C. W74-12063

BAILEY OIL CONTENT MONITOR, Esso Research and Engineering Co., Floram Park,

For primary bibliographic entry see Field 5A. W74-12066

A FEASIBILITY STUDY OF USING REMOTE-LY SENSED DATA FOR WATER RESOURCE

MODELS, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 2A. W74-12072

THE INTERDEPENDENCE OF LAKE ICE AND CLIMATE IN CENTRAL NORTH AMERICA. Wolf Research and Development Corp., Riverdale, Md.

For primary bibliographic entry see Field 2C. W74-12074

INSTRUCTION MANUAL FOR EXPENDABLE DEW POINT HYGROMETER.

EG and G International, Inc., Waltham, Mass. Environmental Equipment Div. For primary bibliographic entry see Field 2B. W74-12078

FLOW VISUALIZATION USING A SELECTIVI-TY SENSITIVE FLUORESCENT DYE, Aerospace Research Labs., Wright-Patterson

AFB, Ohio.
For primary bibliographic entry see Field 2E.
W74-12080

DETERMINATION OF TRACE METAL POLLU-TANTS IN WATER RESOURCES AND STREAM SEDIMENTS, Dayton Univ., Ohio.

For primary bibliographic entry see Field 5A. W74-12194

MICROWAVES, A NEW TOOL FOR FOREST AND WATERSHED MANAGEMENT, Montana State Univ., Bozeman. Dept. of Electri-

cal Engineering. B. R. McLeod.

Available from the National Technical Informa-Water Resources Research Center, Bozeman, Completion Report No. 53, June 1974. 26 p. 15 fig, 17 ref. OWRT A-061-Mont(1), 14-31-0001-3826.

Descriptors: *Moisture meters, *Microwaves, *Forest management, *Montana, *Watershed management, Measurement, Instrumentation. Identifiers: Controlled burns.

Microwave absorption due to a molecular resonance in water offers a possible means of measuring moisture content in various materials. This report discusses the results obtained from the

first two years of a continuing research program designed to explore the uses of microwaves as a forest and watershed management tool. Two bat-tery-powered, portable microwave moisture meters consisting of modulator, Gunn oscillator, precision attenuator, horn antennas, detector, and precision attenuator, norn antennas, detector, and stable amplifier were developed. One meter was equipped with visual display, the other with dual-track recorder. The meters were tested at a study site on the Lubrecht State Forest near Missoula, Montana from June to September 1972 and 1973. The meters were used extensively to obtain basic data and to provide fuel moisture data for prescribed burns; the data were compared for litter, sticks and duff. Oven drying was used as a standard to evaluate the reliability of the meter. The meters gave consistent results agreeing with the oven dry measurements within plus or minus 3 percent. Results of the study to date have demonstrated the feasibility and usefulness of microwave moisture sensing as a valuable tool in watershed management. The portable meters allow rapid, on-site measurement of fuel moisture content just before and even during prescribed burns. Both types of gear are still in the development stage, but two of the display-equipped meters are already being used by the U.S. Forest Service.

W74-12205

COMPARISON OF GERMANIUM DETECTORS FOR NEUTRON ACTIVATION ANALYSIS FOR MERCURY.

Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab. For primary bibliographic entry see Field 5A. W74-12220

AN IMPROVED METHYLTHYMOL BLUE PROCEDURE FOR AUTOMATED SULFATE DETERMINATION,

Georgia Univ., Athens. Inst. of Ecology. For primary bibliographic entry see Field 2K. W74-12228

ARCHAEOLOGICAL SURVEY IN THE TOM-BIGBEE RIVER DRAINAGE AREA: MAY-JUNE, 1970.

Mississippi State Dept. of Archives and History, Jackson. S. O. McGahey.

Mississippi Archaeological Survey Preliminary Report No 2, Jackson, 1971. 33 p, 5 fig.

Descriptors: *Archaeology, *Data collections, *Water resources development, *Mississippi, Conservation, Regional development, Preservation, History. Identifiers: *Tombigbee River Valley.

Part of the activities of the Tombigbee River Val-ley Water Management District has been to pro-tect existing natural resources. The Mississippi Department of Archives and History conducted an archaeological survey in the 12-county area of the District. Although the survey was brief, 77 sites were identified and described. The location and were identified and described. The location and historic value of these sites will enter into future considerations for water resource development projects, as many of the sites are of such significance that they deserved to be saved and, possibly, developed as historic sites. It is recommended that further archaeological information be researched on the sites described and that further research be undertaken to discover other sites. It research be undertaken to discover other sites. It is also recommended that the Tombigbee River is also recommended that the Tombigbee River Valley Water Management District give careful consideration to developing the sites and protect-ing them against possible destruction from work on projects of the District. (Poertner) W74-12240

A TEMPERING RESERVOIR AND MANIFOLD FOR FLOWING-WATER AQUARIUMS, National Marine Fisheries Service, Oxford, Md. Middle Atlantic Coastal Fisheries Center.

H. S. Tubiash. The Progressive Fish-Culturist, Vol 36, No 2, p 114, April 1974. 2 fig.

Descriptors: Technology, *Temperature control, Laboratory tests, Temperature, Methodology, Continuous flow, Sea water, Equipment. Identifiers: *Tempering reservoirs.

A simple device for supplying warmed flowing sea water for the laboratory study of aquatic and marine fauna is described. The unit can elevate the temperature of water flowing through at the rate of 1 liter per minute approximately 15C. (Katz) W74-12257

A PORTABLE APPARATUS FOR PRESSURE

SIEVING BOTTOM SAMPLES, Southern Illinois Univ., Carbondale. Fisheries Research Lab. and Dept. of Zoology. R. C. Heidinger, and J. B. Stahl. The Progressive Fish-Culturist, Vol 36, No 2, p 116-117, April 1974.

Descriptors: *Sampling, *Bottom sampling, *Sieves, On-site data collections, Benthos, Sediments, Technology, Methodology, Design, Equip-Identifiers: *Pressure sieving.

A compact, lightweight apparatus suitable for pressure sieving bottom samples from a small boat is described. Pressure sieving is faster and more convenient than flotation sieving. The process and specifics of this unit are detailed. The procedures does not seem to bias the sampling according to comparisons with flotation-sieved samples. (Katz)

AN IMPROVED CHEMICAL DELIVERY AP-PARATUS FOR USE IN INTERMITTENT FLOW BIOASSAYS.

Bureau of Sport Fisheries and Wildlife, Warm Springs, Ga. Southeastern Fish Control Lab. J. H. Chandler, Jr., H. O. Sanders, and D. H. Walsh.

Bulletin of Environmental Contamination and Toxicology, Vol 12, No 1, p 123-128, July 1974. 1 fig, 5 ref.

Descriptors: Technology, *Design, Bioassays, Analytical techniques, Methodology, Laboratory tests, Flow systems, Pollutant identification. Identifiers: *Intermittent-flow bioassay.

An apparatus designed to eliminate the difficulties previously encountered in intermittent-flow toxicant systems is described. It is easily adapted for use on existing diluters, has no moving parts, and is easily constructed of readily available materials. Variation in delivery volume is easily achieved by varying the volume of the device. The metering device consists basically of a 15-ml conical centrifuge tube that is filled with two siphons and a capillary tube. A diagram and complete specifics for construction and operation are given. Tests indicate that this apparatus is consistently very accurate. (Katz) W74-12272

ACCURACY OF PRECIPITATION MEASURE-MENTS FOR HYDROLOGIC MODELING, Silver Spring, Md. National Weather Service, Hydrologic Research and Development Lab For primary bibliographic entry see Field 2B. W74-12304

A TECHNIQUE TO OBTAIN ICE MOVEMENT, Alaska Univ., College. Geophysical Inst For primary bibliographic entry see Field 2C.

Field 7-RESOURCES DATA

Group 7B—Data Acquition

COLUMN SCANNING WITH SIMULTANEOUS USE OF 241AM AND 137CS GAMMA RADIA-

Agricultural Univ., Wageningen (Netherlands). For primary bibliographic entry see Field 2G. W74-12319

POTENTIAL OF GEOPHYSICAL METHODS FOR STUDYING FRESH-WATER DISCHARGES IN THE COASTAL ZONES OF SEAS. For primary bibliographic entry see Field 2L. W74-12329

THE POTENTIAL OF METEOROLOGICAL SATELLITE CLOUD OBSERVATIONS FOR DELINEATION OF SIGNIFICANT FEATURES OF COASTAL UPWELLING OFF OREGON,

Gerth Satellite Corp., Washington, D.C.
J. M. Meneely, and E. S. Merritt.
Available from NTIS, Springfield, Va 22161, as
COM-73-10896, Price \$3.00 printed copy; \$2.25
microfiche. Final Contract Report for National Oceanic and Atmospheric Administration, March 1973. 97 p, 39 fig, 2 tab, 3 ref, 2 append. NOAA Contract 2-35462.

Descriptors: *Remote sensing, *Ocean circulation, *Cloud cover, *Oregon, Currents(Water), Clouds, Oceanography, Fog, Satellites(Artificial). Identifiers: Upwelling(Oceanography).

Upwelling of subsurface water along the central Oregon coast was studied by analysis of satellite-observed cloud patterns. Sea-surface temperature distributions were compared with observed cloud patterns for a major upwelling event in late August 1972. Both the region of coldest water and the coastal fog band tended to broaden toward the south, but the temperature value could not be directly related to the extent of the fog area. A persistent, eddy-like feature was observed in the seasurface temperature distribution, but it appears that such small-scale irregularities in the temperature field do not in themselves produce visible cloud features except in the case of thin shallow fog. The duration of the nightime land breeze and the strength of the daytime northerly wind component appear to play major roles in determining whether or not coastal fog occurs during the day. The onset, existence, and cessation of upwelling are related to several recognizable cloud situations. Satellite imagery can provide a basic tool for monitoring upwelling off Oregon. (Knapp-USGS) W74-12338

ECOLOGICAL ASPECTS OF AQUATIC BIOLO-GY THROUGH TIME-LAPSE PHOTOGRAPHY, Maryland Univ., Solomons. Center for Environmental and Estuarine Studies.
For primary bibliographic entry see Field 5C.

W74-12345

BOTTOM PHOTOGRAPHS OF BLACK SEA, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 2J. W74-12386

WAVE ENERGY CONVERTER ARRAY, Laitram Corp., New Orleans, La.

J. M. Lapevre. U.S. Patent No 3,818,703, 5 p, 7 fig; 4 ref; Official Gazette of the United States Patent Office, Vol 923, No 4, p 1286, June 25, 1974.

Descriptors: *Patents, *Waves(Water), Equipment, Gravity waves, Ocean waves.
Identifiers: *Wave energy, *Power sources, *Energy sources.

The apparatus for converting the energy of surface waves in a liquid such as an ocean, comprises an array of buoyant helical members mounted for rotation about an axis. The pitch of the helical members equals or is greater than the length of the expected waves and the members are floated on surface with their axes oriented so that wave length of the waves matches the pitch of the he-lices times the cosine of the angle between the helical axes and the direction of wave propagation. nencia axes and the direction of wave propagation.

In one embodiment the array is a large chevron formed of two groups of helical members and is pivotable about the apex of the chevron. In another embodiment the helical members are arranged in zig-zag fashion. Means are provided for adjusting the angles between the arms of the chevron in the one case, and the adjacent arms of the zig-zag in the other case. The helical members can be coupled to one or more driven systems, such as electrical generators or friction (Sinha-OEIS)

INTRODUCTION TO BASIC REMOT SENSING FOR ENGINEERING GEOLOGISTS, DEMOTE Illinois Univ., Urbana. Dept. of Civil Engineering.

P. J. Tarkoy. Available from the National Technical Information Service, Springfield, Va 22161 as PB-224 754; \$4.75 in paper copy, \$2.25 in microfiche. June, 1971. 169 p, 13 fig, 10 tab, 305 ref, append.

Descriptors: *Remote sensing, Cameras, Electromagnetic waves, Exploration, Geophysics, In-strumentation, Photography, Films, Polarity. *Electromagnetic Microwave, Radiometers, Scanners, Electromagnetic spectrums, Polarization, Bands.

The object is to present a technical discussion of the theory of the electromagnetic spectrum and relevance to remote sensors, describe the bands and sensors used in application, and relate how they can be useful in engineering geology and geological exploration. Discussions of each sensor's capabilities, most useful application, and examples of past experiences are also included. Discussed are electromagnetic radiation--its spec-trum, interaction with the atmosphere and with geologic materials, its reflections and charges in polarization; photographic spectrum, photographic sensors; procurement of data; non-photographic spectrum; non-photographic sensors-radiometers, scanners, active microwave, passive microwave and other types; and general applica-tions of remote sensors. (Campbell-NWWA)

OIL/WATER INTERFACE LABORATORY EVALUATION, DETECTOR

Esso Research and Engineering Co., Florham, NI For primary bibliographic entry see Field 5A. W74-12637

BIOASSAY DILUTER CONSTRUCTION.

Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office. For primary bibliographic entry see Field 5A. W74-12646

CALCULATION OF WATER TEMPERATURE OF RIVERS.

Moncton Univ. (New Brunswick). Dept. of Engineering. N. Marcotte, and V. L. Duong.

J Hydrol (Amst). Vol 18, No 3/4, p 273-287. 1973. Illus. English summary. Identifiers: *Canada, Rivers, *Water temperature,

Chaudiere River(Que), Du Nord River(Que).

Water temperature was calculated at hourly intervals for periods of several consecutive months in Chaudiere and Du Nord rivers, Quebec, Canada. Calculations were made by the thermal budget method using routine meteorological and hydrological observations from nearby stations. Hourly observations of water temperature for 112

consecutive days on Du Nord river were com-pared with hourly calculated values: the maximum difference is 3.3C, the overall figure is 1.2C and the maximum mean monthly difference is 0.9C. Comparable results were obtained for Chaudiere river. A discussion follows on method, results and differences between the 2 rivers.--Copyright 1974, Biological Abstracts, Inc. W74-12707

A MINIATURE GRAVITY-FED THERMOCOU-

PLE PSYCHROMETER,
Agricultural Research Service, Phoenix, Ariz.
Water Conservation Lab. S. T. Mitchell, B. A. Kimball, and W. L. Ehrler. Agron J. Vol 65, No 2, p 238-239, 1973. Illus.

Descriptors: *Hygrometry, *Humidity, Measurement, Instrumentation.
Identifiers: Gravity, *Psychrometer, Thermocou-

A miniature gravity-fed thermocouple psychrometer was constructed and tested over a wide range of humidities and flow rates. The unit gave accurate wet bulb depression in 6-mm flow tubes through an acrylic plastic block with a minimum flow rate on only 0.06 m/sec at 35% RH (relative humidity) and of only 0.09 m/sec at 11% RH. The psychrometer also agreed exactly with a standard psychrometer (Assmann type) in open air without forced ventilation or radiation shielding .-- Copyright 1973, Biological Abstracts, Inc. W74-12747

7C. Evaluation, Processing and **Publication**

COMPUTER MANAGEMENT OF A COMBINED SEWER SYSTEM, Municipality of Metropolitan Seattle, Wash.

For primary bibliographic entry see Field 5D. W74-12003

GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO USING ERTS-1 DATA: PROGRESS REPORT II.

Colorado School of Mines, Golden. Dept. of Geology. For primary bibliographic entry see Field 7B. W74-12016

HYDROLOGIC DATA FOR LITTLE ELM CREEK, TRINITY RIVER BASIN, TEXAS, 1972, Geological Survey, Austin, Tex. B. B. Hampton. Open-file report, May 1974. 74 p, 2 fig, 3 tab.

Descriptors: *Basic data collections, *Small watersheds, *Texas, *Rainfall-runoff relationships, *Hydrologic data, Streamflow, Data collections, Stream gages, Discharge(Water), Storm ru-

Identifiers: *Little Elm Creek(Tex).

Rainfall, runoff, and storage data were collected during the 1972 water year for the 75.5-square-mile area above the stream-gaging station Little Elm Creek near Aubrey, Texas. The investigation is scheduled to continue through a period of both above- and below-normal precipitation to define the various factors used in the analyses of rainfallrunoff relationships. The stream has mostly a straight course, although in detail it is distinctly sinuous, with old channels, cutoff meander loops, and the remnants of several oxbow lakes present in the lower reach. The stream has a wide flood plain in the lower half of the watershed. The climate of the study area is temperate and subhumid.

WATER RESOURCES OF THE POWDER RIVER BASIN AND ADJACENT AREAS, NORTHEASTERN WYOMING, Geological Survey, Washington, D.C. W. G. Hodson, R. H. Pearl, and S. A. Druse. Hydrologic Investigations Atlas HA-465, 1973. 4 sheets, 9 fig, 11 tab, 4 maps, 70 ref.

Descriptors: *Water resources, *Wyoming, *Groundwater, *Surface waters, Water quality, Water yield, Data collections, Hydrological data, Streamflow, Hydrogeology, Groundwater basins. Identifiers: *Powder River Basin(Wyoming).

General information is given concerning the availability and quality of groundwater resources of the Powder River Basin, Wyoming, in a 4-sheet hydrological atlas. The Powder River Basin is a nydrological atlast. The Powder River Basin is a structural and topographic basin bounded on the west by the Bighorn Mountains, on the southwest by the Casper arch, on the east by the Black Hills, and on the south by the Laramie Range and Hartville uplift. Mean annual precipitation decreases basinward from 16.32 inches at Sundance and 15.91 inches at Sheridan to 14.00 inches at Gillette and 11.80 inches at Casper. Potential evaporation is high, especially in the Powder River Basin, and is several times the precipitation; consequently, much snow, surface water, and soil moisture evaporate to the atmosphere. Alluvium along irrigated valleys is recharged in part from irrigation water. Some movement of water between formations probably occurs in the subsurface. Discharge is mainly by evaporation, seepage to springs and lakes, transpiration by plants, and pumpage from wells. Most groundwater development has been for stock and domestic purposes, and wells are usually drilled and developed to supply water sufficient for these needs only. The quality of ground-water ranges from good to highly mineralized. Dis-solved solids can be expected to be less than 100 mg/l in water from igneous and metamorphic rocks of Precambrian age and from intrusive igneous rocks of Tertiary age. The average rate of discharge per square mile is shown on a map for each station. The yields from the nonmountainous drainage basins (Belle Fourche River, Cheyenne River, and the southern and eastern parts of the Powder River Basin) generally are less than 0.05 cfsm (cubic feet per second per square mile), and from the mountain stations generally are more than 0.3 cfsm. Discharge from streams in the nonmountainous areas is greatly affected by storage in stockwater reservoirs and by the variable pattern of thunderstorm activity over the area. (Knapp-USGS) W74-12056

A NUMERICAL MODEL OF MATERIAL TRANSPORT IN SALT-WEDGE ESTUARIES,

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2L. W74-12057

DRAINAGE AREAS OF TEXAS STREAMS, GUADALUPE RIVER BASIN.

Geological Survey, Austin, Tex. Open-file report, August 1974, 24 p, 1 fig, 1 tab.

*River basins, *Drainage area, Descriptors: *Texas, Data collections, Hydrologic data. Identifiers: *Guadalupe River basin(Tex).

Drainage areas are determined by measurements Drainage areas are determined by measurements at 214 points within the Guadalupe River basin, Texas. The latitude and longitude of the points of determination and the drainage area in square miles above each point are tabulated. (Knapp-USGS) W74-12060

ERTS-1 APPLICATIONS IN HYDROLOGY AND

WATER RESOURCES,
National Aeronautics and Space Administration,
Greenbelt, Md. Goddard Space Flight Center.

For primary bibliographic entry see Field 7B.

ANALYSIS OF SOME METHODS FOR OBTAIN-ING SEA SURFACE TEMPERATURE FROM SATELLITE OBSERVATIONS, Goddard Space Flight Center. National Aeronautics and Space Administration, Greenbelt, Md.

Available from NTIS, Springfield, Va 22161 as NY3-23467, Price \$3.25 printed copy; \$2.25 microfiche. NASA Technical Memorandum NASA-TM-X-66235, April 1973. 20 p, 2 fig, 1 tab,

*Satellites(Artificial), *Water temperature, Sea water, Clouds, Water vapor, Solar radiation, In-frared radiation. *Remote

Satellite measurements of sea surface temperature must be corrected for atmospheric moisture, cloud contamination, reflected solar radiation and other sources of error. Procedures for reducing errors are discussed. Routine accuracies of 1 deg are possible, given low noise spectral measurements in the infrared. (Knapp-USGS) W74-12063

HYDROGEOLOGIC DATA FROM GREELEY, WICHITA, SCOTT AND LANE COUNTIES, KANSAS.

Geological Survey, Garden City, Kan. For primary bibliographic entry see Field 4B. W74-12068

WATER QUALITY AND RELATED STUDIES, JACKSONVILLE AREA, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5B.

W74-12077

SOLMNEQ: SOLUTION-MINERAL EQULIBRI-UM COMPUTATIONS, California Univ., Berkeley. Dept. of Geology and

For primary bibliographic entry see Field 2K. W74-12086

NUMERICAL ANALYSIS OF GROUNDWATER

For primary bibliographic entry see Field 4B. W74-12104 FENCO, Toronto (Ontario).

COMPUTER USES IN WATER SYSTEMS: CON-FERENCE REPORT. Water Research Association, Marlow (England).

For primary bibliographic entry see Field 6A. W74-12107

STORET-THE EPA WATER QUALITY DATA SYSTEM.

Environmental Protection Agency, Washington, For primary bibliographic entry see Field 6A. W74-12108

COMPUTER USES IN WATER SYSTEMS: CON-

FERENCE PAPERS. Water Research Association, Marlow, (England). For primary bibliographic entry see Field 6A. W74-12109

COMPUTER BASED MANAGEMENT SYSTEMS--OPPORTUNITIES IN THE NEW OR-

For primary bibliographic entry see Field 6A. W74-12110

ASPECTS OF MONITORING AND CONTROL

OF WATER QUALITY,
Great Ouse River Authority (England). For primary bibliographic entry see Field 5A.

COMPUTER INVESTIGATIONS OF WATER MOVEMENTS IN LAKES.

For primary bibliographic entry see Field 2H. W74-12118

REMOTE CONTROL OF A WATER SYSTEM USING AN ON-LINE MINI COMPUTER,

East Worcestershire Waterworks Co. (England). R. H. Burch, and K. C. Marlow. In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 251-264, 25-27 September 1973. 5 fig, 1 tab.

Descriptors: *Water resources, *Remote control, *Computers, *Water works, *Telemetry,
*Monitoring, Operation and maintenance, Communication, Data processing, Regions. Identifiers: England.

The factors which have created the need for telecontrol in the East Worcestershire Waterworks Company area of 300 square miles are given, together with a summary of the original specification. A detailed description of the system follows and includes the communication system, the configuration of a typical out-station, the form of the central control and the function of the software. The system was commissioned in 1970 and the operational experience that has been gained since then is discussed. The paper concludes with some general observations and a hint of possible future development. (See also W74-12107) (Bell-Cornell) W74-12121

AN INTRODUCTION TO COMPUTER INFOR-MATION SYSTEMS IN DISTRIBUTION, For primary bibliographic entry see Field 4A. W74-12122

COMPUTERS IN STRUCTURAL DESIGN, Constructional Industry Research and Information Association, London (England). For primary bibliographic entry see Field 8A. W74-12123

USE OF COMPUTERS BY THE CONSULTING ENGINEER IN THE DEVELOPMENT OF WATER RESOURCES, For primary bibliographic entry see Field 6A. W74-12124

RECENT DEVELOPMENTS IN COMPUTING SYSTEMS AND REMOTE TERMINALS, For primary bibliographic entry see Field 6A. W74-12125

COMPUTER USES IN WATER SYSTEMS: CON-TRIBUTED PAPERS.

Water Research Association, Marlow (England). For primary bibliographic entry see Field 6A. W74-12126

A CASE STUDY OF THE SUSSEX/KENT RIVER AUTHORITIES' INTEGRATED HYDROMET-RIC DATA PROCESSING SYSTEM.

Sussex River Authority (England). P. F. Drake.

In: Computer Uses in Water Systems: Contributed Papers. A Water Research Association Conference. University of Reading, England, p 1-4, 25-27 September 1973. 1 fig.

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

Descriptors: Computers, *Data processing, *River basin commissions, *Hydrometry, Water resources development, Water balance, Design, Hydrologic data, Rainfall, Computer programs, River flow, Planning, Management. Identifiers: Information, *United Kingdom.

The increase in the volume of data and in the com-plexity of processing and the lack of available suitable staff prompted the Sussex River Authority, in 1968, to consider the use of computers to assist its efficient functioning. The Kent River assist its Efficient functioning. The Kells Wick Authority Engineers Department became a limited liability partner. Work began with a review of the possible areas of application in the technical de-partments of both Authorities. It became evident that emphasis must be upon water resources rather than on engineering. The approach adopted was to concentrate the Authorities' resources on one area and to insure this being done as thoroughly as possible. Developed was the objective to be able to produce a regular Water Balance sheet for any area on or under the ground. The flow of informa tion necessary for making up a Water Balance is shown diagramatically. Outlined are the design shown diagramatically. Outlined are the design criteria adopted for a proposed family of integrated, free-standing, self-contained computer systems. The first system that was programmed, a Rainfall System, is discussed. Discussed also are organizational developments, the Water Resources Board involvement, and a proposed flow system. (See also W74-12107) (Bell-Cornell) W74-12107. W74-12127

COMPUTER SERVICES AND APPLICATION IN THE GREATER LONDON COUNCIL'S DE-PARTMENT OF PUBLIC HEALTH ENGINEER-ING.

Greater London Council (England). Dept. of Public Health Engineering. For primary bibliographic entry see Field 5G. W74-12129

PROPOSED KIELDER WATER RESERVOIR SCHEME COMPUTER APPLICATION IN YIELD ASSESSMENT, Northumbrian River Authority (England).

For primary bibliographic entry see Field 4A. W74-12130

GENERAL ENGINEERING COMPUTER USE AT THE WELLAND AND NENE RIVER AUTHORITY,

Welland and Nene River Authority (England). For primary bibliographic entry see Field 4A. W74-12131

THE DESIGN OF A TWO-RESERVOIR RIVER REGULATING SCHEME, South Staffordshire Waterworks Co. (England).

For primary bibliographic entry see Field 4A. W74-12132

THE USE OF A COMMERCIAL TIME-SHAR-ING COMPUTER FOR WATER RESOURCE PLANNING,

Severn River Authority (England). For primary bibliographic entry see Field 6A.

A GENERAL PURPOSE DIGITAL MODEL OF A WATER RESOURCE SYSTEM,

Leicester Univ. (England). Dept. of Engineering. For primary bibliographic entry see Field 6A. W74-12135

THE APPLICATION OF A SIMULATION MODEL TO THE PLANNING AND MANAGEMENT OF WATER RESOURCES IN LAN-

Lancashire River Authority (England). For primary bibliographic entry see Field 4B. W74-12136

COMPUTER ASSISTED QUANTITATIVE SPEC-TROGRAPHIC ANALYSIS,
Water Research Association, Marlow (England).

For primary bibliographic entry see Field 5A.

THE COMPUTER SIMULATION OF THE OPERATION OF A BANK OF RAPID GRAVITY

Water Research Association, Marlow (England). For primary bibliographic entry see Field 5D. W74-12141

COMPUTER ORIENTED APPROACH OF A WATER DISTRIBUTION SYSTEM, National Inst. of Scientific Research, Quebec. For primary bibliographic entry see Field 4A. W74-12142

ANALOGUE AND HYBRID METHODS FOR THE ANALYSIS AND PLANNING OF WATER DISTRIBUTION NETWORKS.

Ring-Belt Ltd. (West Germany); and Montan-Forschung (West Germany). For primary bibliographic entry see Field 4A. W74-12145

UPPER WABASH SIMULATION MODEL. PRO-GRAM DOCUMENTATION AND EXTENSION, Purdue Univ., Lafayette, Ind. Water Resources Research Center. For primary bibliographic entry see Field 4A.

PROCEDURES FOR FILLING GAPS IN HYDROLOGIC EVENT SERIES, Pennsylvania State Univ., Harrisburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.

IDENTIFICATION OF PARAMETERS IN AN INHOMOGENEOUS AQUIFER BY USE OF THE MAXIMUM PRINCIPLE OF OPTIMAL CONTROL AND QUASI-LINEARIZATION, California Univ., Los Angeles. Dept. of Systems Engineering.

For primary bibliographic entry see Field 2F. W74-12308

W74-12291

DATA FROM CONTROLLED DRILLING PRO-GRAM IN LEE AND OGLE COUNTIES, IL-LINOIS,

Illinois State Geological Survey, Urbana For primary bibliographic entry see Field 4B. W74-12317

STREAM FLOW CHARACTERISTICS OF: GREENBRIER RIVER SUB-BASIN, West Virginia Dept. of Natural Resources, Char-

leston. M. S. Baloch, E. N. Henry, and W. H. Dickerson. June 1969. 95 p, 41 fig, 23 tab.

Watersheds(Basins), *River basins, Streamflow, Large watersheds, Floods, Hydrology, Rivers, Runoff, Surface waters, River flow, Low flow, Natural flow, Average flow, Low-flow frequency, Flood recurrence interval, Flow duration, Flow rates, Flow characteristics.
Identifiers: *Greenbrier River Sub-basin(W Va).

Streamflow data in summary form for five gaging stations were presented. Data included extremes of high and low flows, flow durations and estimates for the frequency or return period for given flows. Greenbrier River Basin located in southeastern West Virginia drains 1,656 square miles. The river elevation drops 1,250 ft in a length of 145.7 miles. Annual basin runoff ranges from 10 to 25 inches. The largest runoff occurs in winter and early spring months. (Humphreys-ISWS) W74-12323

WATER RESOURCES OF WISCONSIN, LAKE

SUPPRIOR BASIN,
Geological Survey, Washington, D.C.
H. L. Young, and E. L. Skinner.
For sale by USGS, Washington, DC 20242, Price
\$2.00 per set. Hydrologic Investigations Atlas HA524, 1974. 3 sheets, 27 fig, 4 tab, 61 ref.

Descriptors: *Water resources, *Wisconsin, Lake Superior, *Hydrologic data, Data collections, Water yield, Groundwater, Surface waters, Water

quality, *Maps.
Identifiers: *Lake Superior Basin(Wisc).

Moderate to large quantities of good-quality water are available in much of the Lake Superior basin Wisconsin, but, in some localities not even small quantities are available. Although ground-water is widespread, more surface water is used. Lake Superior, a vast body of good-quality water, is the main source of surface water. Streamflow is not dependable in some places because of low runoff during drought. Moderate to large flows are available in the St. Louis, White, Nemadji, Bois Brule, and Montreal Rivers. Floods are infrequent, and flood damages are small. Lakes are numerous in some areas of end moraine and outwash. Groundwater is available in moderate to large quantities from two sources: glacial sand and gravel, and sandstones. Both sources can yield more than 500 gpm to wells in some areas, but in a few areas even domestic supplies are difficult to obtain. Small supplies generally can be obtained from lava flows. The quality of both groundwater and surface water generally is good. (Knapp-W74-12335

RESOURCES OF WISCONSIN-WATER MENOMINEE-OCONTO-PESHTIGO BASIN,

BASIN, Geological Survey, Washington, D.C. E. L. Oakes, and L. J. Hamilton. For sale by USGS, Washington, DC 20242, Price \$1.75 per set. Hydrologic Investigations Atlas HA-470, 1973. 4 sheets, 25 ref.

Descriptors: *Water resources, *Hydrologic data, *Wisconsin, *Data collections, Basic data collections, Surface waters, Groundwater, Water Surface-groundwater relationships, Water quality, Water utilization.

Identifiers: *Wisconsin River basin(Wis),

Identifiers: *Wisconsin River basin(Wis), Menominee River(Wis), Oconto River(Wis), Peshtigo River(Wis).

This 4-sheet hydrologic atlas describes the water resources of the Menominee-Oconto-Peshtigo River basin in Wisconsin. The physical settings. River basın in Wisconsin. The physical settings, availability, distribution, movement, quality, and use of water are discussed. This atlas is one of a series of 12 river-basin studies designed to describe in general terms the water resources of the State. The basin is bounded by the surfacewater divides of the Wisconsin, Wolf, and Fox Rivers, the Wisconsin-Michigan boundary along the Brule and Menominee Rivers, and Lake the Brule and Menominee Rivers, and Lake Michigan (Gree Bay). Large amounts of good quality water are available. The surface water withdrawal in the basin is three times that of groundwater. Ninety-three percent of the surface water used in the basin is for industrial purposes. Non-withdrawal uses of surface water are for power generation, recreation, and wildlife habitat. Groundwater is used for most community, rural, and industrial supplies. Groundwater is available from sand and gravel deposits and sedimentary bedrock. Domestic and stock supplies are available everywhere in the basin. The sandstone and sand and gravel aquifers commonly yield more than 500 gpm to wells. Most areas in the basin have adequate supplies of water available for growth and development. Water problems are minor and are related primarily to water quality. Both groundwater and surface water have high hardness; high iron content is a local problem in groundwater. Reaches of some streams are polluted by industrial or municipal wastes. Saline water occurs in the sandstone aquifer near Marinette and locally in the crystalline aquifer. (Knapp-USGS) W74-12336

DATA ON SELECTED LAKES IN WASHINGTON, PART II,

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 5A. W74-12341

AUTO-QUAL MODELLING SYSTEM,

Environmental Protection Agency, Annapolis, Md. Annapolis Field Office. For primary bibliographic entry see Field 5B. W74-12342

FLOOD PLAIN INFORMATION: KINGSLAND CREEK, CHESTERFIELD COUNTY, VIRGINIA.

Army Engineer District, Norfolk, Va. For primary bibliographic entry see Field 4A. W74-12393

FLOOD PLAIN INFORMATION: OLDTOWN CREEK AND TRIBUTARY, CHESTERFIELD COUNTY, VIRGINIA,

Army Engineers District, Norfolk, Va. For primary bibliographic entry see Field 4A. W74-12394

FLOOD PLAIN INFORMATION: MAUMEE AND AUGLAIZE RIVERS, DEFIANCE, OHIO, Army Engineers District, Detroit, Mich. For primary bibliographic entry see Field 4A. W74-12395

SIMULATION OF THE DIFFUSION OF DIS-SOLVED SALTS IN AQUIFERS,

California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 5B.
W74-12594

HYDROLOGICAL ANALYSES USING AT-MOSPHERIC VAPOR DATA, Connecticut Univ., Storrs. Inst. of Water Resources.

For primary bibliographic entry see Field 2A. W74-12596

MAP SHOWING DEPTH TO BEDROCK, HART-FORD SOUTH QUADRANGLE, CONNEC-TICUT.

Geological Survey, Hartford, Conn. E. H. Handman, and J. B. Byrnes. Miscellaneous Field Studies Map MF-487 D, 1974. I sheet, I map, 3 ref.

Descriptors: *Soil surveys, *Connecticut, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks, *Mans.

Identifiers: Hartford(Conn), *Depth of bedrock.

A map indicates depth of bedrock below land surface in the Hartford South Quadrangle, Connnecticut. The locations of bedrock outcrops were obtained by field mapping and from a surficial geology map. Depths to bedrock are inferred from logs

of wells and test holes and excavations for utility lines and foundations supplemented by data from a contour map of the bedrock surface. Depths shown are a generalization of localized high variable conditions and do not include any weathered (decomposed) bedrock. (Knapp-USGS) W74-12627

CONTOUR MAP OF THE BEDROCK SUR-FACE, TARIFFVILLE QUADRANGLE, CON-NECTICUT-MASSACHUSETTS,

Geological Survey, Hartford, Conn. E. H. Handman.

man.

Miscellaneous Field Studies Map MF-512 C, 1974. 1 sheet, 1 map, 4 ref.

Descriptors: *Soil surveys, *Connecticut, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks, *Maps.

Identifiers: Tariffville(Conn), *Bedrock surface

Contours show the altitude of the bedrock surface in the Tariffville Quadrangle, Connecticut and Massachusetts. The position of the contours is based largely on data from wells, test holes, and published geologic maps supplemented by knowledge of the geologic history of the region. The maps shows the configuration of the bedrock

The maps shows the configuration of the bedrock surface if all unconsolidated earth materials were removed. (Knapp-USGS)

MAP SHOWING DEPTH TO BEDROCK, OLD LYME QUADRANGLE, CONNECTICUT, Geological Survey, Hartford, Conn.

D. B. Meade. Miscellaneous Field Studies Map MF-558 B, 1974. 1 sheet, 1 map, 5 ref.

Descriptors: *Soil surveys, *Connecticut, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks, *Map.

Identifiers: Old Lyme(Conn), *Depth to bedrock.

A map indicates depth to bedrock (ledge) below land surface in the Old Lyme Quandrangle, Connecticut. The locations of bedrock outcrops were obtained from a bedrock geology map and unpublished surficial geology maps. Depths to bedrock are inferred from logs of wells and test holes and data from continuous seismic profiles under the Connecticut River supplemented by data from the contour map of the bedrock surface. Depths shown are a generalization of localized high variable conditions and do not include any weathered (decomposed) bedrock. (Knapp-USGS) W74-12629

CONTOUR MAP OF THE BEDROCK SUR-FACE, GLASTONBURY QUADRANGLE, CON-NECTICUT.

NECTICUT, Geological Survey, Hartford, Conn. R. B. Ryder, and E. H. Handman. Miscellaneous Field Studies Map MF-561 B, 1974. I sheet, I map, 2 ref.

Descriptors: *Soil surveys, *Connecticut, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks, *Maps.

Identifiers: Glastonbury(Conn), Bedrock surface map.

Contours show the altitude of the bedrock surface in the Glastonbury Quadrangle, Connecticut. The position of the contours is based largely on data from wells and test holes and a bedrock map supplemented by knowledge of the geologic history of the region. The map shows the configuration of the bedrock surface if all unconsolidated earth materials were removed. (Knapp-USGS) W74-12630

CONTOUR MAP OF THE BEDROCK SUR-FACE, ELLINGTON QUADRANGLE, CONNEC-TICUT.

TICUT,
Geological Survey, Hartford, Conn.
E. H. Handman, and R. B. Ryder.
Geological Survey Miscellaneous Field Studies
Map MF-604 A, 1974. I sheet, I map, 3 ref.

Descriptors: *Soil surveys, *Connecticut, *Geologic mapping, *Bedrock, Geologic investigations, Overburden, Soils, Sediments, Rocks, *Maps.

Identifiers: Ellington(Conn), *Bedrock surface map.

Contours show the altitude of the bedrock surface in the Ellington Quadrangle, Connecticut. The position of the contours is based largely on data from wells and test holes, a surficial geology map, and a bedrock geology map supplemented by knowledge of the geologic history of the region. The map shows the configuration of the bedrock surface if all unconsolidated earth materials were removed. (Knapp-USGS)

MAP SHOWING AVAILABILITY OF GROUND-WATER, WARREN QUADRANGLE, MASSACHUSETTS,

Geological Survey, Boston, Mass.

C. J. Londquist.
Miscellaneous Field Studies Map MF-541 E, 1974.
1 sheet, 1 map, 4 ref.

Descriptors: *Groundwater, *Water yield, *Massachusetts, Hydrogeology, Aquifer characteristics, *Maps, Water wells. Identifiers: Warren(Mass).

Availability of water from unconsolidated deposits in the Warren Quadrangle, Connecticut is shown by a map. Areas in which most properly developed individual wells can be expected to yield less than 25 gpm have deposits including till, very fine sand, silt, and clay with a variable water-saturated thickness as well as sand, gravel, and interbedded sand and gravel with a water-saturated thickness of 10 feet or less. Areas in which most properly developed individual wells can be expected to yield more than 25 gpm have deposits including fine to very coarse sand, gravel, and interbedded sand and gravel with a water-saturated thickness of greater than 10 feet. Unconsolidated deposits are everywhere underlain by crystalline bedrock. Properly developed individual bedrock wells generally yield less than 20 gpm. (Knapp-USGS) W74-12632

MAP SHOWING DRAINAGE AREAS, WARREN QUADRANGLE, MASSACHUSETTS,

Geological Survey, Boston, Mass. C. J. Londquist.

Miscellaneous Field Studies Map MF-541 F. 1974. 1 sheet, 1 map.

Descriptors: *Streams, *Watersheds(Basins), *Drainage area, *Massachusetts, River basins, River systems, Surface waters, Watersheds(Divides).
Identifiers: Warren(Mass).

A map shows stream systems and drainage areas that contribute streamflow to selected sites on streams in the Warren Quadrangle, Connecticut. Drainage areas shown have not been adjusted for the manmade changes in the natural regimens such as storm sewers, diversion dams, canals, and tunnels. (Knapp-USGS) W74-12633

APPLICATION OF ERTS-1 DATA TO THE PROTECTION AND MANAGEMENT OF NEW JERSEY'S COASTAL ENVIRONMENT, Earth Satellite Corp., Washington, D.C. For primary bibliographic entry see Field 2L. W74-1263

Field 7—RESOURCES DATA

Group 7C-Evaluation, Processing and Publication

HYDRAULIC CONSTANTS OF TIDAL EN-TRANCES 1: DATA FROM NOS TIDE TABLES. CURRENT TARLES AND NAVIGATION CHARTS.

Florida Univ., Gainesville. Coll. of Engineering. For primary bibliographic entry see Field 2L.

HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN

AREA, 1972, Geological Survey, Austin, Tex.

E. E. Wehmeyer. Open-file report, June 1974. 49 p, 3 fig, 1 tab.

Descriptors: *Urban hydrology, *Texas, *Basic data collections, *Rainfall-runoff relationships, Hydrologic data, Rainfall, Streamflow, Urbaniza-

tion, Storm runoff.
Identifiers: *Austin(Tex)

Hydrologic studies in the Austin urban area, Texas are made to determine the effects of progressive urbanization on infiltration, rates of peak discharge, and rainfall-runoff relations in the Waller Creek watershed. Rainfall and runoff data from the rural Wilbarger Creek watershed are used for comparative purposes in determining the effects of existing and progressive urbanization in the Waller Creek watershed. Rainfall and runoff data are presented for the Waller Creek and Wilbarger Creek study areas for the 1972 water year (October 1, 1971 to September 30, 1972). (Knapp-W74-12653

RECENT DEVELOPMENTS IN PREPARING COLORED AGROCLIMATIC MAPS BY COM-PUTER,

Department of Agriculture, Ottawa (Ontario). W. Baier, W. R. Sharp, and J. G. Roberts.
Can J Soil Sci, Vol 53, No 1, p 133-134, 1973.
Identifiers: *Agroclimatic maps, *Computer mapping, *Maps, Seasonal, Soils, Publications.

Digitizing and plotting techniques were improved and combined with standard cartographic and photomechanical procedures to produce waterproofs for checking and negatives suitable for plating and printing for full color publication. These neelopments are described, and a full color sample map prepared from derived data of seasonal water deficits is presented. The computer mapping technique reduced tedious cartographic work usually necessary for the preparation of maps for publication. Besides the time-saving aspect in the preparation of maps for publication, the digitizing of working maps has the additional advantage that the data are on magnetic tapes and therefore available for combination with information from other data banks such as those for soils and plant distribution.--Copyright 1974, Biological Abstracts, Inc. W74-12695

8. ENGINEERING WORKS

8A. Structures

WHAT'S NEW IN WATER AND SEWER PIPE, K. A. Godfrey, Jr.

Civil Engineering-ASCE, (American Society of Civil Engineers), Vol 44, No 5, p 72-73, May 1974.

Descriptors: *Tunnel linings, *Sewers, *Steel pipes, *Construction Concrete, *New York. materials, Channels, Identifiers: *Staten Island(NY), Steel tunnels,

For a savings of time and money, steel channels were used to line a tunnel for a ten foot OD sanita-

Steel channels, Neoprene gaskets.

ry sewer in Staten Island, New York. The steel tunnel lining was designed to carry permanent loading, permitting the contractor to hole the tunnel before placing the cast-in-place concrete liner. Wide steel channels (24 inches) were made and welded flange to flange, then pressed to conform to the tunnel shape. The length of the job is 17,000 feet, and is characterized by having a wide seg-ment width of 48 inches to ensure rapid tunneling, and being the first major tunnel in New York City using neoprene gaskets which are factory applied. (Murphy-FIRL) W74-12007

FIELD AND MODEL STUDIES ON A SILTA-TION PROBLEM IN THE FRASER RIVER, Department of Public Works, Vancouver (British

E. O. Isfeld, D. Hay, and J. Rossouw. In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 44-63, 1973. 7 fig, 3 ref.

Descriptors: *River training, *Sediment control, *Suspended load, Bypasses, Groins(Structures), Flow control, Model studies, Hydraulic models,

Identifiers: *Fraser River(Canada).

A siltation problem developed behind a training wall in the Fraser River at New Westminster, Canada. Field and model studies were undertaken to examine remedial measures. The field studies included detailed measurements of suspended load and directional velocity profiles across various sections of the river in the area of the training wall. The model study consisted of two stages. In the first stage, the model bed was fixed and mainly suspended load was studied. In the second stage a movable bed was used and the bedload was studied. Secondary flow developing in the river bend caused flow close to the bed to move towards the left bank, resulting in the high sediment concentra-tion in this area. The water passing over the upstream opening in the training wall was thus heavily loaded with suspended sediment. Due to an increase in width of flow behind the training wall, the influence of the opening extended into the river drawing a higher percentage of flow than the ratio of cross-sectional areas. The widening also resulted in a decrease in flow velocities behind the wall with subsequent settling of suspended material. A remedial measure which permitted some flow through the opening and access for navigation required this secondary flow to be reversed near the opening. The obvious solution was to test groins upstream of the opening which would effect a local reversal in the curvature of the flow. Vari ous schemes were tested in which a groin situated 500 feet upstream of the upstream weir opening in the training wall was varied in length. A large increase in efficiency against sedimentation occurred with increasing groin length up to a length of approximately 370 feet. (See also W74-12087) (Knapp-USGS) W74-12089

COMPUTERS IN STRUCTURAL DESIGN,

Constructional Industry Research and Information Association, London (England).

L. S. BIARC.
In: Computer Uses in Water Systems: Conference Papers, A Water Research Association Conference, University of Reading, England, p 275-281, 25-27 September 1973. 5 ref.

Descriptors: Computers, *Structural design, Analytical techniques, *Computer programs, Optimization, Water resources, Projects, Descriptors: *Optimization, Systems analysis. Identifiers: *Detailing

The background to the involvement of computers in structural design is discussed briefly together with the comparatively recent application to the potentially more profitable area of detailing. The problems facing the structural designer are used to establish the context in which computer design is applied. Outlined are the development of analytical methods and the results of a number of projects in which such methods have been subjected to experimental verification. The area of optimization in design is investigated and references are made to particular optimizing models. Design aids, such as the LUCID system, which are distinct from optimizing programs are discussed, and the paper concludes with a prediction as to the direction in which the whole area could reasonably be expected to develop during the next ten years. ee also W74-12107) (Bell-Cornell) W74-12123

APPLICATION HYDROLOGIC AND HYDRAU-LIC RESEARCH TO CULVERT SELECTION IN MONTANA, VOLUME 1, REPORT,

Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics. E. R. Dodge.

Available from NTIS, Springfield, Va 22161 as PB-220 093, Price \$3.00 printed copy; \$2.25 microfiche. Final Report to Montana Department of Highways, Helena, Planning and Research Bureau, September 15, 1972. 105 p.

Descriptors: *Design flow, *Design flood, *Frequency analysis, *Montana, *Culverts, Highways, Roads, Design data, Hydraulic struc-Flood recurrence interval, Synthetic hydrology

A regional streamflow frequency analysis was performed, involving both natural and synthetic streamflow records, to estimate flood magnitude of various recurrence intervals for each of 230 Montana watersheds. Using regression analysis, flood peak prediction equations for the 2-, 5-, 10-, and 50-year recurrence intervals were developed fr each of 9 contiguous geographic regions in Montana. These equations predict the flood peak as the product of powers of various hydrologic watershed parameters. A detailed discussion of the hydraulic conditions which occur for various types of culvert flow is presented along with modern criteria and methods for culvert selection. (Knapp-USGS) W74-12340

DEEPWATER PORTS.

For primary bibliographic entry see Field 6E. W74-12619

SAVANNAH MUCK DIKES--RESTORATION FEASIBILITY STUDY.

Weaver Enterprises, Waterloo, N.Y.

Available from NTIS, Springfield, Va 22161 as PB-220 934, Price \$5.50 printed copy; \$2.25 microfiche. Final Report to Wayne County Planning Board, February 1973. 18 p, 13 fig. HUD Contract CPA-NY-02-36-1001.

Descriptors: *Flood control, *New York, *Muck soils, *Dikes, Hurricanes, Flootion, *Feasibility studies, Cities. Identifiers: *Savannah(NY). Dikes, Hurricanes, Floods, Flood protec-

The mucklands in the Savannah, N. Y. area were inundated and partially destroyed by the floods which followed Hurricane Agnes in June 1972. This feasibility study was set up to determine the economic feasibility of restoring the mucklands to production. (Knapp-USGS) W74-12638

8B. Hydraulics

FIRST CANADIAN HYDRAULICS CON-FERENCE PROCEEDINGS.

Alberta Univ., Edmonton. Dept. of Civil Engineer-

Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publi-cation No 4, 1973. 672 p.

Descriptors: *Hydraulics, *Conferences, *Canada, Streamflow, Rainfall-runoff relationships, Open channel flow, Groundwater movement, Mathematical models, Simulation analysis.

The Canadian Hydraulics Conference provides a forum for the exchange of ideas among Canadian hydraulic engineers. The first conference, in 1973, nydraulic engineers. Ine tirst conference, in 1973, was attended by 165 registered participants. The topics discussed in the first conference were river engineering, hydraulic aspects of pollution, numerical models, and structures. (See W74-12088 thru W74-12106) (Knapp-USGS) W74-12087

BACKWATER EFFECTS AT END-DUMPED CONSTRICTIONS ON ALLUVIAL CHANNELS, Directorate of Designs, Irrigation, Bhubaneswar

R P Das and I R Nuttall

In: Proceedings of Canadian Society for Civil Enin Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973. Alberta University Water Resources Center Publication No 4, p 30-43, 1973. 7 fig. 11 ref. NRC Grant

Descriptors: *Backwater, *Alluvial channels, *Open channel flow, Flow around objects, Scour, Froude number, Deflection, Abutments, Canada. Identifiers: *Channel constrictions

The most common method of restricting a river channel is by end-dumping fill material from one or both banks. Backwater rise due to a dumped or both banks. Backwater rise due to a dumped constriction depends on the Froude number of the undisturbed flow and the shape of the constriction. Constriction shape in turn depends on interaction between the bed, the dumped material and the flow and on the method of placement. The backwater rise for end-dumped constrictions at equilibrium scour depends on material and flow properties. A 7.5-foot-wide flume, 60 feet long, with a maximum flow of 3 cfs was used for tests properties. A 7.5-toot-wide flume, 60 feet long, with a maximum flow of 3 cfs was used for tests. Bed material 1.5 feet thick was placed over a length of 50 feet. Tests were run at three Froude numbers, 0.50, 0.29, and 0.10. The corresponding uncontracted normal depths were 0.18, 0.26, and 0.38 feet, respectively. With these depths the maximum scour was limited to 1.5 feet, the depth of the bed. Maximum backwater rise on an alluvial bed is much less than for a rigid bed. The effect of bed material size is of relatively little significance. (See also W74-12087) (Knapp-USGS)

FIELD AND MODEL STUDIES ON A SILTA-TION PROBLEM IN THE FRASER RIVER, Department of Public Works, Vancouver (British

For primary bibliographic entry see Field 8A. W74-12089

FLOOD PLAIN STUDIES IN ONTARIO. Dillon (M. M.), Ltd., Toronto (Ontario). For primary bibliographic entry see Field 6F. W74-12090

FLOW CHARACTERISTICS OF THE OUTLET CHANNELS OF LAKE WINNIPEG FOR NATURAL AND REGULATED CONDITIONS, Manitoba Hydro.

D. J. Phelps, and R. W. Coley. In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 77-95, 1973. 9 fig, 12 ref.

Descriptors: *Discharge measurement, *Flow characteristics, *Lakes, *Open channel flow, Regulated flow, *Canada, Outlets, Regulation, Stage-discharge relations, Flow measurement, Gaging stations.
Identifiers: *Lake Winnipeg(Canada).

The method utilized by Manitoba Hydro to analyze the Nelson River flows through the outlet channels of Lake Winnipeg is described. Lake Winnipeg outflow relationships were developed for natural and for improved and controlled conditions. tions. Flow distribution and water surface profiles were computer through an intricate chain of natural channels controlled by a series of rapids and falls, mildly sloping lakes, and excavated chanraus, milety stoping takes, and excavated chan-nels, for both open water and ice conditions. Hydrometric surveys, simulation of rapids and falls (natural weirs), and determination of channel latus (untural weirs), and determination of channel bed and ice roughness are described. Analytical flow charts are included. (See also W74-12087) (Knapp-USGS) W74-12091

RESISTANCE TO FLOW IN ICE COVERED RIVERS--A SIMULATION STUDY WITH AR-TIFICIAL ROUGHNESS, New Brunswick Univ., Fredericton. K. S. Davar, and E. S. M. A. Ismail.

In: Proceedings of Canadian Society for Civil En-In: Proceedings or canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973. Alberta University Water Resources Center Publication No 4, p 107-128, 1973. 11 fig., 1 ab, 16 ref.

Descriptors: *Streamflow, *Ice cover, *Closed conduit flow, *Flow resistance, Roughness(Hydraulic), Hydraulics, Model studies.

Hydraulic Hydraulics, Hydraulics, Hydraulic Hydraulics Identifiers: Ice-covered rivers

Resistance to flow under ice was studied in a rectangular conduit with relatively large roughness elements at the top, of various sizes and spacings, as may occur in an ice covered channel. The measured velocity profiles did not conform to the nor-mal logarithmic velocity profiles for turbulent flow. (See also W74-12087) (Knapp-USGS) W74-12092

PREDICTING DEPTH-DISCHARGE RELA-TIONSHIPS FOR SAND-BED RIVERS, Manitoba Univ., Winnipeg. Dept. of Civil Engineering. For primary bibliographic entry see Field 4A. W74-12093

LABORATORY STUDY OF SCOUR AT CHAN-NEL BENDS.

Research Council of Alberta, Edmonton. B. A. Nwachukwu.

In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973. Alberta University Water Resources Center Publication No 4, p 144-164, 1973. 7 fig, 2 photo, 3 tab,

Descriptors: *Scour, *Meanders, *Alluvial channels, Sediment transport, Stream erosion, Vortices, Turbulent flow, Hydraulic models, Flumes.

To define the location of maximum depth of scour in channel bends, laboratory tests were conducted to find the relationship between maximum depth of scour, bend geometry and flow variables. The bed material consisted of sand having a median sieve diameter of 0.35 mm. Graphs are presented showing the variation of the ratios of maximum to mean depth with deflection angle, curvature ratio, depth/width ratio and Froude number. Besides the curvature it was found that flow condition and deflection angle could be significant parameters affecting the maximum depth at bends. (See also W74-12087) (Knapp-USGS)
W74-12094

HYDRAULIC INFLUENCES ON AUFEIS GROWTH, For primary bibliographic entry see Field 2C. W74-12095

INTERFACILA SHEAR STRESS IN DENSITY

WEDGES, Canada Centre for Inland Waters, Burlington (Ontario)

T. M. Dick, and J. Marsalek.

In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 176-191, 1973. 3 fig, 1 tab, 2 ref.

Descriptors: *Stratified flow, *Density stratification, *Shear stress, *Saline water-freshwater interfaces, Saline water intrusion, Path of pollutants, Mixing.
Identifiers: *Density wedges.

When a fluid flows into another fluid of different density, stratification may occur and a distinct interface may be formed. As the interface is usually sloping the phenomenon is often called a density wedge. Various methods for the estimation of the interfacial shear stress coefficient in density wedges were examined to determine the significant parameters and the best method for computing the coefficient for practical purposes. An interim procedure is suggested which gives con-sistent results over a wide range of Reynolds numbers and different wedge types. The interfacial shear stress may be estimated from the Moody diagram for pipe flow by taking the hydraulic values as the new depth of the bottom layer and assumes the relative roughness as 'smooth'. (See also W74-12087) (Knapp-USGS) W74-12096

CIRCULAR TURBULENT JET IN AN OPPOS-

ING INFINITE STREAM, Alberta Univ., Edmonton. Dept. of Civil Engineer-

For primary bibliographic entry see Field 5B. W74-12097

LATERAL MIXING CHARACTERISTICS OF THE HYDRAULIC JUMP IN A SPATIALLY-VARIED FLOW, Ottawa Univ. (Ontario). Dept. of Civil Engineer-

For primary bibliographic entry see Field 5B. W74-12098

REAERATION IN OPEN-CHANNEL FLOW. Canada Centre for Inland Waters, Burlington For primary bibliographic entry see Field 5G. W74-12099

APPLICATION OF THE CONCEPT OF BIFUR-CATED PLUME TO SOME OIL POLLUTION PROBLEMS IN THE STRAIT OF GEORGIA, Alberta Univ., Edmonton. Inst. of Earth and Planetary Physics.
For primary bibliographic entry see Field 5B.

Field 8—ENGINEERING WORKS

Group 8B-Hydraulics

NUMERICAL MODEL STUDIES OF RIVERS

AND ESTUARIES, National Research Council of Canada, Ottawa (Ontario). Hydraulics Lab.

In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p315-336, 1973. 7 fig, 3 ref.

Descriptors: *Numerical analysis, *Finite element analysis, *Rivers, *Estuaries, *Mathematical analysis, *Rivers, *Estuaries, *Mathematical models, Model studies, Canada, Streamflow, Path of pollutants, Design.

Numerical hydrodynamic modeling of rivers and estuaries in one and two dimensions is reviewed. The accuracy is considered sufficient for most engineering purposes. Applications to the St. Lawrence, Fraser and St. Clair Rivers are discussed. The formulation of a model involves the representation or schematization of the physical geomorphology by discrete sections. Rivers may be represented by lengthwise sections in one dimension while wide estuaries are better represented by a rectangular grid in two dimensions. The physical equations which describe the flow are then solved for finite increments both in time and space by numerical methods that are efficient and economical. (See also W74-12087) (Knapp-USGS) W74-12101

CONTROL OF SEA WATER INTRUSION BY SALTWATER PUMPING--A MATHEMATICAL

MacLaren (James F.) Willowdale (Ontario). For primary bibliographic entry see Field 5G. W74-12102

A NUMERICAL MODEL FOR FLOW PAST A SPUR-DIKE.

Windsor Univ. (Ontario). Dept. of Civil Engineer-

ing.
N. Zaghloul, and J. A. McCorquodale. In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University water Resources Center Publication No 4, p 355-368, 1973. 10 fig, 8 ref.

*Scour, *Mathematical models, *Groins(Structures), Flow around objects, Numerical analysis, Stream erosion, Hydraulic structures, Jetties, Flow control, River training. Identifiers: *Spur dikes

A mathematical model simulates the scour around spur dikes. Initially a two-dimensional numerical model is used for the flow pattern around a 'sheet' pile dike, utilizing the Reynolds equations with a constant eddy viscosoty. The Reynolds equations are transformed into a Helmholtz vorticity equation and a Poisson type equation. These two equations are solved alternately, by a finite difference technique, to obtain the variations in vorticity and stream function with time. After the flow pattern has become relatively steady, the bed is allowed to erode and the stream function is redefined in terms of a depth averaged velocity. A bed shear function is computed from the local velocity, turbulence and vorticity. Finally, the difference between the local shear and local bed resistance is reduced to zero by adjusting the local depth. (See also W74-12087) (Knapp-USGS) W74-12103

NUMERICAL ANALYSIS OF GROUNDWATER

FENCO, Toronto (Ontario). For primary bibliographic entry see Field 4B. W74-12104

WATERSHED MODELLING USING A SOUARE

Waterloo Univ. (Ontario), Dept. of Civil Engineer-For primary bibliographic entry see Field 2A.

A COMPUTER SIMULATION OF THE MOTION OF A SOLID PARTICLE IN A TURBULENT FLOW WITH FREE SURFACE,

Canada Centre for Inland Waters, Burlington

B. G. Krishnappan

W74-12105

In: Proceedings of Canadian Society for Civil Engineering 1st Canadian Hydraulics Conference, Alberta University, Edmonton, May 10-11, 1973: Alberta University Water Resources Center Publication No 4, p 435-450, 1973. 5 fig, 10 ref.

Descriptors: *Sediment transport, *Turbulent flow, *Open channel flow, *Simulation analysis, Suspended load, Settling velocity, Turbulence.

The random motion of a solid particle in a twodimensional and uniform turbulent flow in open channels was simulated using a computer. The simulation is based on the hypothesis that the solid particles are dispersed, essentially in the same manner as 'fluid lumps' except that the solid particles continuously sink relative to fluid lumps. A normal function (Gaussian curve) was used as the probability density distribution for the random vertical position of the particle at any instant. (See also W74-12087) (Knapp-USGS) W74-12106

COMPUTER AIDED ECONOMIC DESIGN OF WATER DISTRIBUTION SYSTEM.

University Coll., London (England). Dept. of Civil Engineering. A. K. Deb.

In: Compueter Uses in Water Systems: Contributed Papers. A Water Research Association Conference, University of Reading, England, p 75-78, 25-27 September 1973. 4 equ, 4 ref.

Descriptors: *Water distribution(Applied). Networks, *Design, *Pipes, Hydraulics, *Optimization, *Economics, Water supply, Valves, Pressure head, Pumping Reservoir storage, Hazen-Williams equation, Pipe flow, Digital computers, Systems analysis, Mathematical models. Identifiers: *Cost minimization.

The complexity of deriving the optimum cost solu-

tion for a water distribution system is explained. Considering the initial costs of pipes, pumps and elevated service reservoir, and maintenance and power cost, a method to obtained optimum pressure surface, inlet hydraulic head and position of the service reservoir has been proposed. The method of analysis gives the workable minimum cost pipe sizes of a network of given inflows, outflows and hydraulic pressure surface over the network. A pipe network system solved to illustrate the validity of the approach is discussed. Results showed a 33% saving in cost when the elevated reservoir was located at the center of the network. The effect of population density on cost saving is

TRANSVERSE MIXING IN AN ICE-COVERED RIVER.

mentioned. A high speed digital computer is necessary in order to use this optimization method for least cost solution of a water distribution network.
(See also W74-12107) (Bell-Cornell)

Alberta Univ., Edmonton. Dept. of Civil Engineer-

For primary bibliographic entry see Field 2E. W74-12293

W74-12140

ADJUSTMENT OF RIVER CHANNEL CAPACI-

TY DOWNSTREAM FROM A RESERVOIR, Exeter Univ. (England). Dept. of Geography. For primary bibliographic entry see Field 4A. W74-12298

PIPE FLOW MODELS OF A KENTUCKY LIMESTONE AQUIFER, Kentucky Univ., Lexington. Dept. of Geology. For primary bibliographic entry see Field 2F. W74-12326

MEASUREMENTS OF SAND TRANSPORT BY WIND ON A NATURAL BEACH, For primary bibliographic entry see Field 2L.

APPLICATION HYDROLOGIC AND HYDRAU-LIC RESEARCH TO CULVERT SELECTION IN MONTANA, VOLUME 1, REPORT, Montana State Univ., Bozeman. Dept. of Civil Engineering and Engineering Mechanics. For primary bibliographic entry see Field 8A. W74-12340

ANNULUS-LOSS ESTIMATES CAN BE MORE

For primary bibliographic entry see Field 8C. W74-12534

PROBLEMS ENCOUNTERED IN DRILLING AND COMPLETING DEEP WELLS. B A Eaton

Society of Petroleum Engineers of AIME Preprint SPE 3662, 1971. 8 p, 10 fig, 1 tab, 15 ref.

Descriptors: *Drilling, *Deep wells, Exploration, Oil industry, Oil wells, Gasses, Statistics, Planning, Pore pressure, Data collection, Boreholes, Mud, Cement, Temperatures. Identifiers: *Exploration wells, Surface hole, Intermediate hole, Hole below intermediate casing, Fracture pressure curves, Rigs, Wildcat well drilling.

Problems encountered in drilling and completing wells to 15,000 feet and below are reviewed. Statistical trends in deep well drilling indicate that increasing numbers of such wells will be drilled each year. Problems associated with this activity are similar to those of past shallow drilling. However, these problems are more severe and much ore expensive than those in the past. The role of a drilling coordinator, with regard to the development of sound, workable drilling plans, is discussed. A method of well planning is presented that, if used, will reduce the frequency of expension replacement of the property of the prop sive problems in deep drilling. One problem involves the attempted completion of wells drilled below depths where commercial production is ex-tremely unlikely to be found. A means of avoiding this problem is also discussed. A great majority of drilling and completion problems could be eliminated by better planning, and better trained on-site rig supervisors carrying out previously agreed upon well plans. (Campbell-NWWA) W74-12540

FACTORS AFFECTING DESIGN, DEVELOP-MENT AND COST OF WELLS, Universal Oil Products, St. Paul, Minn. Johnson

J. L. Mogg. Johnson Drillers Journal, p 1-3, May-June, 1973. 1

Descriptors: Aquifer characteristics, Test wells, Descriptors: Aquiter characteristics, 1est wells, "Groundwater, Drilling, Pumping, Testing, Water wells, Sampling, Specific capacity, Well data, Screens, Casings, Costs, Drawdown, Cost analysis, Drilling logs, Drilling equipment. Identifiers: "Mini-well, Pilot hole, High-velocity horizontal-jetting tool.

Modern practices of well design permit designers to follow clearly understood, orderly and relativeto follow clearly inherstood, orderly and relatively simple steps to design a successful well with confidence. These steps can be stated as follows: Drilling a pilot hole (4-6 inches in diameter) and often converting the pilot hole into a Mini-Well. From the pilot or test hole, as it is sometimes called, the location, thickness, and character of the aquifer (or aquifers) is obtained. Using inexpensive geophysical equipment, the driller's log can be verified with either an electric or gamma-ray log. Portable, easily operated equipment for making either type of log can be purchased for less than \$2,500, consequently the cost of making the log is small. The results of pumping the Mini-Well provides specific capacity data that used in conprovides specific capacity data that used in conjunction with the geometry of well and aquifer permits an accurate prediction of the maximum yield of a large capacity well constructed at the site. (Campbell-NWWA) W74-12541

PORE-VOLUME COMPRESSIBILITY OF CON-SOLIDATED, FRIABLE, AND UNCON-SOLIDATED RESERVOIR ROCKS UNDER HYDROSTATIC LOADING. Chevron Oil Field Research Co., Richmond, Calif.

For primary bibliographic entry see Field 8E W74-12542

THE COST OF GEOPHYSICAL EXPLORA-

TION. Water Well Journal, Vol 28, No 8, p 44-46, August, 1974. 2 fig.

Descriptors: *Bore hole geophysics, Logging(Recording), Electrical well logging, Ex-ploration, *Costs, *Groundwater, Rural areas, Drilling, Drillers logs, Electrical resistivity, Instru-

mentation, *Exploration.

Identifiers: *Geophysical exploration, National Demonstration Water Project, Rural water, Groundwater development, Geophysical methods.

The value of geophysics in groundwater explora-tion and development has been profoundly demonstrated. Unfortunately, the cost of using geophysical techniques has usually been quite high. Thus geophysical aids to groundwater development have mainly been restricted to large budget projects where its use could be economically justified. This situation has been unfortunate in the situation of the situat This situation has been unfortunate in that many smaller, low budget projects, especially those requiring maximum economic efficiency, could greatly benefit from geophysical techniques. Within recent years, however, advances in solid-state electronics have made possible the development of low cost, portable geophysical instruments. Many of these instruments were designed precifically for use in groundwater evaluation. specifically for use in groundwater exploration and development. Their use permits smaller pro-jects to enjoy the benefits of geophysical techniques. One such small project was a National Demonstration Water Project near Logan, West Virginia. Geophysical techniques do not guarantee success, but rather serve to locate the site(s) in a given area that offer the most potential for ground water development. The value of the geophysical methods employed was demonstrated. The collection of additional subsurface information aids in the development of a ground water supply, especially for small water systems in which an expensive and laborious test well drilling program is neither economically possible nor practical. (Campbell-NWWA) W74-12544

8C. Hydraulic Machinery

A STUDY OF SELECTED COOLING POND DESIGN TECHNIQUES, South Carolina Univ., Columbia. Coll. of En-

gineering. For primary bibliographic entry see Field 5D. W74-12015

WATER SYSTEM OPERATOR NEEDS BASIC INFORMATION TO KEEP PUMPS WORKING, PART II,

Johnson Drillers Journal, p 2-4, May-June 1974. 5

Descriptors: Water wells, *Groundwater, Specific capacity, Water supply, *Well data, Water works, *Hydraulic structures, Equipment, Turbines, *Hydraulic structures, Equipment, Turbines, Pump turbines, Pumps, Pressure, Pressure head, Drawdown, Water pollution, Head, Head loss, Centrifugal pumps, *Operations.

Identifiers: *Community water systems, *Water system operators, Well performance, Records, Head-capacity curve, Dynamic head, Contamina-

About 80 million people in the United States are served by community water systems that draw upon groundwater sources. In addition, it is estimated that individual wells supply water to 30 mil-lion more persons. Water from good wells, particularly those tapping waterbearing sand forma-tions, is usually of high bacteriological quality, but contamination can occur after delivery into the distribution system. A water well loses capacity slowly over a period of months or years. Usually, there is ample time to detect any deterioration and to plan corrective measures. The operator can select the best time to do the work during the season, day or time of day when there will be the least effect on service to the customer. To accomplish this, it is essential to have records that show trends in well and aquifer performance. The water system operator can use the history to diagnose the cause of a problem or to predict the probable occurrence of a problem. The owner of a system, and his customers, stands to benefit from accurate diagnoses. Benefits accrue in dollars saved and in service rendered. Some signs of water well trouble which the operator should watch for are changes in specific capacity and changes in turbine pump output. (See also W74-10103) (Campbell-NWWA) W74-12526

MEASURING AND USING ROTARY DRILLING TORQUE,

Texaco Research Lab., Bellaire, Tex. H. A. Rundell.

Oil and Gas Journal, Vol 71, No 20, p 76, 81-82, May 14, 1973. 4 fig, 1 ref.

Descriptors: *Rotary drilling, *Oil industry, Measurement, Drilling, Pipes, Penetration, Gears. Identifiers: Torque, Bits, *Torquemeter, Rigs, Rotary speed, U.S. patents.

Recordings of torque and rotary speed from the torquemeter can provide valuable information on the degree of wear of the rotary bit during the course of the bit run, and reliable indications of impending bearing failure. More recently, a modification of the torquemeter has been developed. It allows its use on chain-driven rotaries as well. The Texaco torquemeter measures absolute torque by measuring the angular deflection of a portion of the rotary-drive section. The torquemeter is virtually maintenance-free, and has proven extremely durable over several years' use. Torque measurement accuracy is at least 2% of full scale (usually set at 50,000-ft-lb). Greater sensitivity is possible by setting full scale at 25,000-lb-ft. In addition to its immediate utility, the Texaco It. In addition to its immediate utility, the Texaco torquemeter provides a feedback of formation-bit interaction. This may supply the element necessary to allow computer-controlled minimum-cost drilling to become a practical reality. The Texaco torquemeter is covered by pending and issued U.S. patents. (Campbell-NWWA) W74-12527

INDUCED INFILTRATION AT THE UNIVERSI-TY OF CONNECTICUT WELL FIELD,

Connecticut Univ., Storrs.
For primary bibliographic entry see Field 4B. W74-12529

CAN FREEZING IMPROVE WELLS IN CON-SOLIDATED ROCK AQUIFERS,

Food and Agriculture Organization of the United Nations, Rome (Italy). Land and Water Develop-

For primary bibliographic entry see Field 4B. W74-12532

USE OF ORGANIC POLYMER DRILLING FLUID IMPROVES CORE DRILL EFFICIENCY. For primary bibliographic entry see Field 8G. W74-12533

ANNULUS-LOSS ESTIMATES CAN BE MORE PRECISE.

P. L. Moore

Oil and Gas Journal, Vol 71, No 33, p 111-113, August 13, 1973. 2 fig, 2 tab.

Descriptors: Pressure, *Drilling, Circulation, Mud, Drilling fluids, *Groundwater, Drilling equipment, Wells, Coredrilling, Drill holes, Rotary drilling, Pipes, Flow, Equations, Oil industry. Identifiers: *Annulus loss, *Drill string losses, Standpipe pressures, Surge pressures, Drill collars, Flow patterns, Down-hole measurements.

Annulus pressure loss in a drill string may be determined by reading standpipe pressure directly and subtracting the calculated pressure losses inside drill string and bit. The advantages of this procedure are: (1) The inside measurements of the drill string are more precise than hole-size estimates. (2) Pressure losses through the bit are considered very accurate. (3) Flow patterns inside the drill string and through the bit are generally turbulent, and viscous flow properties have a minor ef-fect on the total pressure loss in this part of the string. (4) Flow patterns in the annulus are generally laminar, and viscous flow properties of the mud affect pressure losses substantially. Disadvantages of using the procedure are: (1) Most of the pressure loss in the circulating system occurs inside the drill string and through the bit. So a 5% error in these calculations would result in a potential 30 to 40% error in determination of total annular pressure losses. (2) The procedure is limited to a determination of total annular pressure losses, and the point of interest is very often just below the last casing seat to the surface, not from total depth to the surface. Accuracy of annulus pres-sure-loss equations is limited because the flow properties of the mud must be measured at a given surface temperature. And these measurements are used in the equations. (Campbell-NWWA) W74-12534

HIGH-PRESSURE DRILLING, W. C. Maurer, J. K. Heilhecker, and W. W. Love. Journal of Petroleum Technology, Vol 25, No 7, p 851-859, July, 1973. 18 fig, 2 tab, 15 ref.

Descriptors: *Drilling, Data, Oil wells, Laboratory tests, High pressure, Sedimentary rocks, On-site tests, Economics, *Oil industry, *Texas. Identifiers: *Novel drills, Lasers, Electron beams, Erosion bits, High-pressure roller bit tests, Rigs, High-pressure triplex pump.

A survey has been made of more than 25 novel drills, and drilling rates were predicted for each of these drills in oil wells on the basis of available laboratory drilling data. Novel drills that thermally spall rock were found to have limited potential for drilling oil wells because most sedimentary rocks will not spall. Devices such as lasers and electron beams had extrapolated drilling rates of less than 1 foot/hour because of the high energy requirement for fusing rock. Research was begun to further evaluate high-pressure bits for oil-well drilling. The following conclusions were reached: (1) A threshold nozzle pressure must be exceeded be-fore high-pressure bits will erode rock rapidly. (2) Conventional triplex mud pumps can be equipped with high-pressure fluid ends to provide low-cost,

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Group 8C-Hydraulic Machinery

reliable, high-pressure pumps. (3) A 2-inch diameter erosion drill operating at pressures up to 13,500 psi drilled Carthage marble at 180 feet/hour, Indiana limestone at 280 feet/hour, and Berea sand-stone at 320 feet/hour. (4) Full-scale high-pressure roller bits operating at pressures of 10,000 to 15,000 psi can drill most rocks two to three times faster than conventional roller bits. (5) High-pressure bits have a potential for producing significant savings in drilling costs, especially in high-cost areas such as deep land wells, offshore wells, or arctic wells. (Campbell-NWWA) W74-12537

THE APPLICATIONS AND LIMITATIONS OF DEEP DRILL STEM TESTING. P. J. Zecchi, and B. J. Scott.

Society of Petroleum Engineers of AIME Preprint SPE 3907, 1972. 9 p, 8 fig, 3 tab, 10 ref, append.

Descriptors: Planning, *Deep wells, Boreholes, *Test wells, Mud, Geologic formations, Equipment, Data, Temperature, Pressure, Sealants, Strength of materials, Drilling fluids, Safety factors, Oil industry, *Texas, *Oklahoma. Identifiers: *Drill stem testing, Open hole testing,

Cased hole testing, Ultra deep wells, Andarko Basin(Tex-Okla), Delaware Basin(Tex), Annulus pressure, Pretest planning, Differential pressures.

A review is presented of the techniques currently utilized in deep well drill stem testing. The procedures for both open hole and cased hole testing are presented with particular emphasis on the problems and existing solutions to these problems. Data from actual drill stem tests in the Anadarko Basin of Texas and Oklahoma and the Delaware Basin of West Texas are reviewed. The trend for ultra deep wells, those below 20,000 feet, has been increasing during the past few years. The entire drilling and service industry has been challenged to provide the equipment and expertise to drill the wells, evaluate the formations, and provide mechanical equipment for producing them. Formation evaluation of these deep zones by a drill stem test has been successful, but much planning and innovation was necessary. High pressure and high temperature are two factors that present unusual problems. Particular attention must be paid to drill pipe and tubular goods in all deep drill stem tests. Very high mud weights also have received considerable attention in planning a deep drill stem test. A case is presented to show that all deep wells can be safely evaluated with a drill stem test. Planning is the key word in obtaining a successful drill stem test. (Campbell-NWWA)

FACTORS AFFECTING DESIGN, DEVELOP-MENT AND COST OF WELLS,

Universal Oil Products, St. Paul, Minn. Johnson For primary bibliographic entry see Field 8B. W74-12541

8D. Soil Mechanics

SEEPAGE RATES AND THE HORIZONTAL FLOW APPROXIMATION,
Agricultural Research Council, Cambridge

(England). Unit of Soil Physics. E. G. Youngs.

Water Resources Research, Vol 10, No 4, p 874-876, August 1974. 5 fig, 6 ref, 1 append.

Descriptors: *Seepage, *Dams, *Groundwater movement, *Porous media, Conductivity, Dupuit-Forchheimer theory, Hydraulics.

Attention was drawn to a particular case of seepage through a porous body in which the flow is everywhere horizontal and hence easily calculated. In an appendix the seepage through a dam core with a cross section in the shape of an

isosceles triangle was shown to be estimated with sufficient accuracy for practical purposes by the horizontal flow approximation. (Schicht-ISWS)

HYDROMETER METHOD FOR DETAILED PARTICLE-SIZE ANALYSIS: 1.
GRAPHICAL INTERPRETATION OF HYDROMETER READINGS AND TEST OF

Agriculture Research Service, Brawley, Calif. Imperial Valley Conservation Research Center. For primary bibliographic entry see Field 2J. W74-12303

8E. Rock Mechanics and Geology

HOW TO DIAGNOSE A THIEF ZONE, Continental Oil Co., Ponca City, Okla. For primary bibliographic entry see Field 8G. W74-12536

PORE-VOLUME COMPRESSIBILITY OF CON-SOLIDATED, FRIABLE, AND UNCON-SOLIDATED RESERVOIR ROCKS UNDER HYDROSTATIC LOADING,

Chevron Oil Field Research Co., Richmond, Calif. G. H. Newman. Journal of Petroleum Technology, Vol 25, No 2, p

129-134, February, 1973. 8 fig, 12 ref.

Descriptors: *Sandstones, *Limestones, Correla-*Rock properties, *Consolidation, *Compressibility, Sampling, Porosity, Data, Pressure, Reservoirs, Pores, Cores, Hydrostatic pressure, Reservoirs, Pores, Cores, Reservoirs, Pores, Cores, Reservoirs, Pores, Reservoirs, Pores, Reservoirs, Reservoirs, Pores, Reservoirs, R

sure, Freezing. Identifiers: Net pressure, Friable rocks, Reservoir rocks, *Pore-volume compressibility, Hydrostatic

The use of pore-volume compressibility-porosity known. The correlations developed by Hall (1953) for both sandstones and limestones have been widely distributed. Van der Knaap (1959) published a similar correlation using limestone samples from a single well and also correlated the with net pressure. Such correlations are attractive because of the simple relationship established. However, those correlations were intended only for well consolidated samples; correlations for friable or unconsolidated samples have not been published. This study compares laboratory data with the published correlations of consolidated samples as well as with values for fri-able and unconsolidated sandstones. The conclusions reached are: (1) The pore-volume compressibility-porosity values obtained are in poor agree-ment with published compressibility-porosity correlations. (2) Pore-volume compressibilities for a given porosity can vary widely according to rock type. (3) Attempts to correlate the data showed that consolidated sandstones differed greatly from limestones and friable and unconsolidated sands, but the data are too widely scattered for correlations to be reliable. (Campbell-NWWA) W74-12542

HYDROLOGY OF RADIOACTIVE-WASTE DISPOSAL AT THE IDAHO CHEMICAL PROCESSING PLANT, NATIONAL REACTOR TESTING STATION, IDAHO, For primary bibliographic entry see Field 5E.

W74-12546

TIDAL FLUCTUATIONS OF WATER LEVELS WELLS IN CRYSTALLINE ROCKS IN NORTH GEORGIA, For primary bibliographic entry see Field 2F. W74-12551

DISPOSAL OF URANIUM-MILL EFFLUENT NEAR GRANTS, NEW MEXICO, For primary bibliographic entry see Field 5E. W74-12552

8F. Concrete

WHAT'S NEW IN WATER AND SEWER PIPE, For primary bibliographic entry see Field 8A. W74-12007

MUD DISPLACEMENT WITH CEMENT SLUR-

C. R. Clark, and L. G. Carter. Journal of Petroleum Technology, Vol 25, No 7, p 775-783, July, 1973. 13 fig, 3 tab, 14 ref.

Descriptors: *Cements, *Muds, Drilling, Drilling fluids, *Slurries, Equipment, Shear stress, Shear strength, Groundwater, Interfaces, Pressure, Pipes, Drag. Identifiers: Annular space, Displacement, Down-

hole environment, Driving forces, Resisting forces, Test cells, Cement/mud interface.

One prerequisite for successful primary cementing is the complete displacement of drilling mud from the annular space. Even after proper techniques for maximum mud displacement efficiency are applied, mud displacement efficiency often remains low. The objective was to re-examine, under conditions closely simulating the down-hole environ-ment, the relative importance of the driving forces available to displace drilling mud from the annulus. The following conclusions were drawn: (1) Pipe movement, either rotation or reciprocation, is a major driving force for mud removal. (2) A well conditioned mud greatly increases mud displace-ment efficiency. (3) Pipe centralization signifi-cantly aids mud displacement. (4) The buoyant driving force resulting from cement-mud density difference has less effect on mud displacement than expected under conditions simulating the down-hole environment. (5) Drag stress at the ce-ment/mud interface can be a significant driving force for mud removal when the cement slurry is in turbulent flow in some part of the annulus. (6) Pipe motion with scratchers substantially improves mud displacement, especially in areas of hole enlargement. (Campbell-NWWA) W74-12543

8G. Materials

CLEANING WATERMAINS USING POLYU-RETHANE SWABS.
Water and Pollution Control, Vol 112, No 5, p 34-

36, May 1974. 4 fig. Descriptors: *Pipes, *Cleaning, *Water pressure, *Hydrants, *Canada, Municipal water, Drainage, Bacteria, Disinfection, Hydrogen ion concentra-

Identifiers: *Polyurethane, *Water mains, Com-pression, Toronto, Swabs, Mains.

A watermain near Toronto, Canada, was cleaned by forcing a polyurethane foam swab through the main via regular water pressures. First, the main valves were closed to isolate the section; the swab was inserted into the top of a compression-type hydrant which had its internal workings previously removed. Water pressure from a fire hose on the hydrant supplied the pressure while the nearest main valve was opened and the swab moved at 100 feet per minute to an open hydrant at the far end of the line. The chance of a swab becoming lodged in a main is small, and can be corrected by a reverse flow. Insertion of the swab is not difficult; most of Ontario's hydrants are of the compression type. For small mains up to 10 inches in diameter there is no problem--it is necessary, however, to ensure the plugging of drain holes. The greatest need for

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swabbing is commonly at municipalities using low pH surface water supplies where filtration treatment is not provided. Removal of detritus by swabbing may be condusive to bacterial growth, and swabs are often treated with disinfectant. (Murphy-FIRL) W74-12006

STORAGE OF PLUTONIUM METAL IN SEALED CANS.

Dow Chemical Co., Golden, Colo. Rocky Flats Div.

For primary bibliographic entry see Field 5D.

ANALYSIS OF ELECTRICAL RESISTIVITY MEASUREMENTS OF SHALLOW DEPOSITS, Iowa State Univ. of Science and Technology, Ames. D. W. Tarman.

D. W. Tarman. MSc thesis 1967. 96 p, 22 fig, 1 tab.

Descriptors: *Electrical resistance, Data collections, Surveys, Groundwater, Hydrologic data, Borehole geophysics, Exploration, Subsurface investigations, Till, Alluvium, Glacial drift, Deposition(Sediments), *Iowa, *Measurement. Identifiers: Wenner method, *Gish-Rooney method, Subsurface materials.

This study was undertaken to analyze several interpretative methods applicable to electrical resistivity data obtained from a geologic setting characteristic of central Iowa. The widespread occurrence of glacial drift in the region requires that data be obtained in ways other than from bedrock exposure. Methods available are borehole investigations, correlation between isolated outcrops and geophysical methods. Of the geophysical methods the electrical resistivity method is, potentially, the fastest and most inexpensive. A resistivity survey was conducted over a preestablished grid on a till covered area and over a series of cross sections in a small alluvium filled valley. The nature of the subsurface materials in both areas was determined through borehole investigations. The resistivity data were analyzed and the values compared to the geologic control. Results indicate that the Gish-Rooney method of continuous depth plotting gives depths which compare most favorably with the geologic control. (Campbell-NWWA)

WATER SYSTEM OPERATOR NEEDS BASIC INFORMATION TO KEEP PUMPS WORKING, PART II.

For primary bibliographic entry see Field 8C. W74-12526

USE OF ORGANIC POLYMER DRILLING FLUID IMPROVES CORE DRILL EFFICIENCY. Johnson Drillers Journal, p 1, 13, May-June, 1974. Identifiers: Revert, Organic polymers, Subsurface formations, Split-tube sampling, Drive-core sampling.

It takes more than just clay and water to make an engineered drilling fluid system. In fact, the best drilling fluid for some types of subsurface formations and some methods of drilling will not contain any clay--the clay being replaced by an organic polymer. Revert finds special application in core-drilling operations. It is easily mixed at the drill site by being sprinkled into the water and recirculated through the pump. Since only a small quantity is required, transport costs are virtually negligible. Numerous interrelated factors affect the cost and results of drilling operations. These include: nature of the formations to be penetrated; capabilities and limitations of drilling equipment; skill, experience and attitude of the drilling crew; accessibility of the job site and cost of transporting materials to the site. Pros and cons of various

types of drilling fluids are discussed. Improved core recovery, less hole trouble, and savings in time and materials can be expected when the drilling fluid is carefully considered in the overall plan for test drilling. (Campbell-NWWA) W74-12533

HOW TO DIAGNOSE A THIEF ZONE, Continental Oil Co., Ponca City, Okla.

M. Felsenthal. Journal of Petroleum Technology, Vol 25, No 7, p 839-840, July, 1973. 1 fig, 1 ref.

Descriptors: *Injection wells, *Tracers, Liquids, *Equations, Permeability, Flow, Pressure, Oil wells, Viscosity, Porosity, *Groundwater, Tests, Formulation, Oil industry. Identifiers: *THIEF zone, Producing wells, Fractions. Waterfloods.

Discussed is a classical method for determining the time required for tracer-tagged liquids to flow from injection wells to producing wells that was formulated by J. C. Calhoun (1953). This method can also be used for evaluating the permeability of the most conductive layer of the formation. This layer may be a 'thief' zone that ought to be closed by subsequent remedial action. Calhoun's method of analysis is time consuming because it involves either a graphical integration or an approximation using a summation of terms. A simpler method was developed that achieves the same purpose with much greater speed and with sufficient accuracy. The method is based on a model of two radial-flow regimes. Radial flow emanates from the injection well, which acts as a 'source,' and converges in the producing well, which acts as a 'sink.' The simpler method was found to be just as effective when using data from a waterflood. The difference in results by the two methods was not considered to be significant for the purposes of the tracer test. (Campbell-NWWA) W74-12536

HIGH-PRESSURE DRILLING, For primary bibliographic entry see Field 8C. W74-12537

THE APPLICATIONS AND LIMITATIONS OF DEEP DRILL STEM TESTING, For primary bibliographic entry see Field 8C. W74-12538

PROBLEMS ENCOUNTERED IN DRILLING AND COMPLETING DEEP WELLS, For primary bibliographic entry see Field 8B. W74-12540

MUD DISPLACEMENT WITH CEMENT SLUR-RIES,

For primary bibliographic entry see Field 8F. W74-12543

THE COST OF GEOPHYSICAL EXPLORA-TION. For primary bibliographic entry see Field 8B. W74-12544

W /4-12344

A REVIEW OF CORROSION MONITORING TECHNIQUES, Fincher, D. R. and Nestle, A. C. D. R. Fincher and A. C. Nestle

D. R. Fincher, and A. C. Nestle. Society of Petroleum Engineers of AIME Preprint SPE 4220, 1972. 14 p, 2 tab, 12 ref.

Descriptors: *Corrosion, Equipment, Metallurgy, *Rusting, Monitoring, Control systems, Maintenance, *Corrosion control, Scour, Erosion, Abrasian, X-ray analysis, Gamma rays, Resistivity, Hydrogen, Oxygen, Carbon dioxide, Liquids, Solids, *Reviews. Identifiers: Metallic systems, *Corrosion detection, Radiography, Electrical resistance technique, Polarization, Resistance method, Galvanic method, AC resistivity technique, Hydrogen probes, Corrograms.

Operators of metallic systems are looking for new and better tools to monitor, measure, or detect changes both in the metal structure itself and in the rate of attack that the structure is experiencing. To prevent corrosion damage, it is necessary to know when, where, and why the attack is occurring. Otherwise, damage can occur before the owner has knowledge of the attack. Corrosion can be monitored or detected using 'after-the-fact' type tools for detection. Perhaps the oldest detection technique is a visual inspection coupled with measurement of pit depths and/or wall thickness. Ultrasonic and x-ray equipment also can be used to determine the extent of damage. Downhole tubing and casing calipers, possibly in conjunction with wall thickness measurements, can be used periodi-cally to assess the extent of corrosion damage. aps the most desirable monitoring techniques are those that are used more or less continually to determine the rate of corrosion attack. These methods also are suitable to assess the success or failure of the corrosion mitigation measures used. Also, a new corrosion monitor-controller is described. Each of the methods has certain advantages, and the practical applications of these different techniques are reviewed. (See also W74-07857) (Campbell-NWWA) W74-12550

INTRODUCTION TO BASIC REMOTE SENSING FOR ENGINEERING GEOLOGISTS, Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 7B. W74-12553

EXPERIENCE IN SANITARY EVALUATION OF THE USE OF POLYETHYLENE PIPES FOR RURAL WATER SUPPLY LINES, (IN RUS-SIAN).

Vsesoyuznyi Nauchno-Issledovatelskii Institut Gigieni i Toksikologii Pestitsidov, Kiev (USSR). For primary bibliographic entry see Field 5D. W74-12716

8H. Rapid Excavation

PROJECT DRUM INLET: EXPLOSIVE EX-CAVATION IN SATURATED SAND, Army Engineer Explosive Excavation Research

Army Engineer Explosive Excavation Research Lab., Livermore, Calif. C. M. Snell, and R. H. Gillespie.

C. M. Sheil, and R. H. Gillespie. Available from NTIS, Springfield, Va. 22161 as AD-769 581, Price \$3.75 printed copy; \$2.25 microfiche. Technical Report E-73-5, August 1973. 81 p. 32 fig, 8 tab, 30 ref.

Descriptors: *Explosives, *Excavation, *Inlets(Waterways), *North Carolina, Dredging, Canals. Identifiers: Outer Banks(NC).

A 385-ft-long section of sand separating the Core Sound, North Carolina, from the Atlantic Ocean was excavated with large explosive charges. Twenty-two separate canisters each containing 1 ton of aluminized ammonium-nitrate slurry were emplaced in two rows. All charges were detonated simultaneously at 1327 hours, December 23, 1971. The detonation successfully removed the sand barrier, forming a continuous channel over 80 ft in width. This channel subsequently washed out to a width of about 1000 ft and was used as an access route to the Raleigh Bay fishing grounds. The project demonstrated the practicality of explosive channel excavation in saturated sand. (KnappuUSGS)

Field 8—ENGINEERING WORKS

Group 81 - Fisheries Engineering

81. Fisheries Engineering

SURFACE-WATER INVESTIGATIONS ON THE LUMMI INDIAN RESERVATION, WASHING-

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 4A.

DISTRIBUTION AND RELATIVE ABUNDANCE OF FISHES IN NEWPORT RIVER, NORTH

National Marine Fisheries Service, Beaufort, N.C. W. R. Turner, and G. N. Johnson.
NOAA Technical Report NMFS-SSRF-666, September 1973. 23 p, 1 fig, 13 tab, 20 ref.

Descriptors: *Fisheries, *North Carolina, *Fish populations, Rivers, Number fish per acre, Estuarine fisheries, Sampling, Marine fish, Freshwater fish

Identifiers: *Newport River(NC).

In Newport River, North Carolina, during 1970, 104 species of fishes were found in monthly sam-pling. Sampling extended from the lower reaches of the estuary upstream into tidal freshwaters, and covered a mid-channel distance of 34.87 km. Most of the species of fishes collected in the system were marine forms. Only 15 essentially freshwater species were collected and 5 of these (longnose, gar, gizzard shad, golden shiner, white catfish, and black crappie) showed varying degrees of tolerance for saline waters. Seven species made up 97% of the total catch which comprised nearly 129,000 individuals. The dominant species were all marine euryhaline forms that used the estuary as a nursery area, penetrating well upstream brackish or even tidal freshwaters. Seasonal distribution and abundance of the dominant species, as well as other species collected in substantial numbers, are discussed. Biomass of fishes in collections by haul seine was estimated at 0.93 g/sq m for littoral waters of the estuary. (Knapp-USGS)

A MANUAL OF FLATFISH REARING,

A MANUAL OF FLATFISH REARING, Skidaway Inst. of Oceanography, Savannah, Ga. D. B. White, and R. R. Stickney. Available from NTIS, Springfield, Va 22161 as COM-74-10364, Price \$3.25 printed copy; \$2.25 microfiche. Georgia University Marine Science Center, Technical Report Series, No 73-7, Sep-tember 1973. 36 p, 6 fig, 3 tab, 37 ref.

Descriptors: *Fish hatcheries, *Fish farming, Fish management, *Aquiculture, Bibliographies, Fish stocking. Identifiers: *Flatfish.

Flatfish may be reared under controlled or semicontrolled laboratory conditions; however, basic knowledge on specific environmental and nutritional parameters is not now available for most flatfish species. The selection of a proper site is probably the most important step toward establishing a facility. Water of low turbidity is highly desirable in culture facilities because outbreaks of disease organisms are often associated with particulate material in the water. Feeding is also enhanced in clear water since the fish are better able to see food particles. Low bacterial and viral levels are required. The site should be located away from any types of industrial or municipal pollution. The water supply should be 0.5 to 2% salinity. Water with a constant temperature of approximately 25 C should provide rapid growth. (Knapp-USGS) W74-12075

LAKE SUPERIOR INVESTIGATIONS.

Minnesota Dept. of Conservation, St. Paul. Div. of Game and Lish

R. Hassinger, and A. Kuechenmeister.

Available from NTIS, Springfield, Va 22161 as COM-73-10800, Price \$3.00 printed copy; \$2.25 microfiche. Minnesota Department of Natural Resources Lake Superior Investigations Completion Report for April 1968 to June 1971. Released October 1971. 7 p, 8 tab.

Descriptors: *Lake Superior, *Lake trout, *Lampreys, *Fish stocking, Fish populations, Fish management, Fisheries, Life history studies, *Minnesota.
Identifiers: *Whitefish.

The Lake Superior lake trout rehabilitation program in Minnesota waters is evaluated by assessment netting. Lake trout abundance steadily increased to 20.7 pounds per thousand feet of net lifted in 1970, then decreased slightly to 17.4 pounds per thousand feet of net in 1971. The incidence of lamprey marks shows an increasing trend. The total wounding rate (fresh and old scars) has increased to 33.6 percent in 1971. White-fish grounds in Minnesota waters are vey limited the only area of consistent production in Grand Portage Bay. During the period whitefish abundance has remained at a high level although a decrease was noted in 1971. The bulk of commercial harvest is in the size group 20-24 inches. These whitefish are from 4 to 8 years old. Lamprey marks on whitefish increased in 1971 corresponding with a decrease in abundance. (Knapp-USGS) W74-12079

OF INTENSIFYING HATCHERY BREEDING OF STURGEONS IN THE DAM RE-GIONS OF HYDROELECTRIC STATIONS, (IN RUSSIAN),

Tr Vologr Otd Nauchno-Issled Inst Ozern Rechn Rybon Khoz. 6. p 125-159, 1972.

Identifiers: *Breeding control, Dams, Flow control, *Sturgeons, Temperature, Hydroelectric powerplants, *Fish hatcheries.

The organization and bioengineering of fish-breeding processes at sturgeon hatcheries located in the dam stretches of rivers are affected by the characteristics of the water regime in connection with stream-flow control. This is reflected in the breeding quality of the spawners. The forced change to pond water and the new operating schedule in-volve a departure from the optimal regime in all hatchery departments—all operations were done at higher than normal temperatures and with large daily variations. One of the most important measures is the complete regulation of water temperature, beginning from the moment of stocking the spawners to the stocking of the rearing ponds with fry. For this purpose it is necessary to modernize the fish-breeding units and to transfer them to closed rooms. It is also necessary to improve the incubation apparatus method of degumming the eggs, counting the juveniles released from the ponds and qualitative evaluation of production.--Copyright 1973, Biological Abstracts, Inc. W74-12149

COMPARATIVE ANALYSIS OF FEEDING OF ONE-SUMMER-OLD PELED COREGONUS PELED (GMELIN), CHIR COREGONUS NASUS

PELED (GMELIN), CHIR COREGONOS NASUS (PALLAS) AND THEIR HYBRIDS GROWN TOGETHER, (IN RUSSIAN), Gosudarstvennyi Nauchno-Issledovatelskii In-stitut Ozernogo i Rechnogo Rybnogo Khozyaist-va, Leningrad (USSR). B. B. Voloshenko.

Vopr Ikhtiol. Vol 13, No 4, p 684-691, Illus, 1973. Identifiers: Acantocyclops. Bosmina. Ceriodaphnia, Chaoborus, Chir, Chironomus,
*Coregonus-nasus, *Coregonus-peled,
Cricotopus, Cyclops, Daphnia, Endochironomus, Glyptotendipes, Microtendipes, Oligochaeta, Ostracoda, Polypenilum, Procladius, Sida, Tanytarsus, *Fish diets, Seasonal, Fish hybrids. The nutrition of 1-summer-old Coregonus peled and C. nasus and their reciprocal hybrids was studied under conditions of pond cultivation. Data are presented which characterize the anatomical structure of the mouth and gullet-branchial ap-paratus, which determines the nature of the nutrition of the fish studied. Hybrid forms of these spetion of the fish studied. Hybrid forms of these spe-cies are able to utilize the fodder base of the pond more fully and the efficiency of pisciculture in-creased significantly. Fodder included: Cyclops, Acantocyclops, Daphnia, Ceriodaphnia, Bosmina, Sida, Ostracoda, Oligochaeta, Endochironomus, Benedicting Christopediese. Migratearding Procladius. Glyptotendipes, Microtendines. Polypedilum, Chironomus, Ephemeroptera, Trichoptera, Tanitarsus, Chironomidae and Chaoborus.—Copyright 1974, Biological Abstracts, Inc. W74-12163

HYDROLOGICAL AND PHYSICOCHEMICAL CHARACTERISTICS OF THE FISH PONDS OF SOUTHERN TADZHIK SSR, (IN RUSSIAN), Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.

For primary bibliographic entry see Field 2H. W74-12166

DATA ON THE HYDROBIOLOGY OF FISH PONDS OF SOUTHERN TADZHIK SSR, (IN RUSSIAN), Akademiya Nauk Tadzhikskoi SSR, Dushanbe.

Institut Zoologii i Parazitologii. S. A. Andrievskaya, N. I. Bogdanov, and F. A.

Izv Akad Nauk Tadzh SSR Otd Biol Nauk. 2. p 73-76, Illus, 1973.

76, inus, 1973. Identifiers: Algae, *Bacteria, *Benthos, *Carp, Fertilization, *Fish breeding, Grass carp, Hydrobiology, Macrophytes, *Phytoplankton, Seasonal, *USSR(Southern Tadzhik SSR), Fish ponds, *Chlorophyta, Biomass.

Data are given on seasonal dynamics of the population and biomass of bacteria, phytoplankton, zooplankton and zoobenthos in 2 experimental ponds (fertilized) and 1 control pond (unfertilized) used for raising carp and grass carp. The popula-tion and biomass of plankton and benthos in the experimental ponds exceeded that of the control pond. The development of aquatic organisms in the ponds depended on the fertilizers applied to them. The food base of the fertilized ponds was higher than in the unfertilized. The intestine of the carp contained 15 spp. and forms of benthos in addition to macrophytes, whereas the food composition of the grass carp was more uniform and conmacrophytes. The investigation was carried out on the ponds of the 'Chubek' fishery located along the former bed of the Afgan-Darya River in southern Tadzhikistan.--Copyright 1974, Biological Abstracts, Inc. W74-12167

RECLAMATION OF WATER FOR REUSE IN CHANNEL CATFISH RACEWAY SYSTEMS, Memphis State Univ., Tenn. Dept. of Biology. For primary bibliographic entry see Field 5G. W74-12203

MINERAL FERTILIZATION OF CARP PONDS IN POLYCULTURAL REARING, Institut fuer Suswasserfischzucht, Plovdiv (Bulgaria). For primary bibliographic entry see Field 5C. W74-12246

EFFECTS OF AERATION IN EARTHEN PONDS ON WATER QUALITY AND PRODUCTION OF WHITE CATFISH,

South Carolina Agricultural Experiment Station, Clemson. For primary bibliographic entry see Field 5C. W74-12251

RESIDUAL CHLORINE RETENTION AND POWER PLANT FISH FARMS,

Oceanic Inst., Waimanolo, Hawaii. For primary bibliographic entry see Field 5C. W74-12266

SHORT TERM TREATMENT MALACHITE GREEN AND FORMALIN FOR THE CONTROL OF ICHTHYOPHTHIRIUS MULTIFILIIS ON CHANNEL CATFISH IN HOLDING TANKS, Alabama Univ., Ala. Dept. of Fisheries and Allied

Aquacultures.

For primary bibliographic entry see Field 5G. W74-12269

OBSERVATIONS ON THE SPAWNING OF THE MISSISSIPPI SILVERSIDES, MENIDIA AU-

California State Dept. of Fish and Game, Sacramento. F. Fisher.

Calif Fish Game, Vol 59, No 4, p 315-316, 1973

Descriptors: Fish, *Spawning, *Fish behavior, *California

Identifiers: Menidia-audens, *Mississippi silversides, *Lexington Reservoir(Calif).

The spawning behavior is described as observed in Lexington Reservoir, Santa Clara County, California, on May 11, 1973. This fish was introduced into California in 1967, orginally in Clear Lake .-- Copyright 1974, Biological Abstracts, Inc. W74-12688

ECOLOGY AND PRODUCTION OF JUVENILE SPRING CHINOOK SALMON, ONCOR-HYNCHUS TSHAWYTSCHA, IN A EUTROPHIC

RESERVOIR,
Oregon State Univ., Corvallis, Dept. of Fisheries and Wildlife For primary bibliographic entry see Field 5C.

W74-12692

THE USE OF SODIUM CYANIDE AS A FISH ERADICANT IN SOME QUEBEC LAKES, Sir George Williams Univ., Montreal (Quebec).

Dept. of Biological Sciences. G. Leduc, Y. Gravel, L. R. Seguin, B. Vincent,

and F. Guibert. Nat Can (Que). Vol 100, No 1, p 1-10, 1973. Illus.

Descriptors: *Piscicides, Pesticide, *Brook trout, Trout, Toxicity, Fry, Fish, Lakes, Fish manage-Canada.

Identifiers: Quebec, Sodium cyanide.

The use of sodium cvanide as a fish eradicant was studied for 4 yr and involved the treatment of 1 pond and 5 small mountain lakes of different sizes and depths, where a total of at least 15 spp. of cold and warm water fishes were encountered. Technical sodium cyanide was applied in briquettes and granular forms at a concentration of 1 ppm and, in most instances, a complete fish-kill was achieved. The toxicity disappeared within 25-40 days, and there was evidence of excellent growth of the brook trout fingerlings planted afterwards. It is possible to handle large quantities of sodium cyanide safely, and this can markedly reduce the cost of lake reclamation programs.--Copyright 1973, Biological Abstracts, Inc. W74-12696

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

METHODS FOR TRANSFERRING WATER RESOURCES RESEARCH FINDINGS TO PRAC-

TICING ENGINEERS, North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 10D.

9C. Research Facilities

W74-12012

UNITED STATES GEOLOGICAL SURVEY ALASKA PROGRAM, 1974. Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4A.

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

SELECTED BIBLIOGRAPHY ON WATER BALANCE OF MONSOON ASIA (III), Meteorological Research Inst., Tokyo (Japan). For primary bibliographic entry see Field 2B. W74-12019

WASTE PROCESSING IN THE CHEMICAL AND PETROCHEMICAL INDUSTRIES--A BIBLIOGRAPHY WITH ABSTRACTS, National Technical Information Service, Spring-For primary bibliographic entry see Field 5D. W74-12069

10C. Secondary Publication **And Distribution**

DIRECTORY OF MANAGERS, ENGINEERS AND SCIENTISTS IN OCEAN WASTE DISPOSAL AND RELATED ENVIRONMENTAL SCIENCE FIELDS,

Interstate Electronics Corp., Anaheim, Calif. Oceanics Div. For primary bibliographic entry see Field 5E. W74-12020

ACTIVE PROJECTS, PURE WATERS

RESEARCH. New York State Dept. of Environmental Conservation, Albany February 1974. 33 p.

Descriptors: *Water pollution control, *Water quality control, *New York, *Water conservation, Research priorities, Metropolitan studies, Environmental control, Waste water treatment, Eutrophication, Nutrient removal, disposal, Scientific personnel. Sludge

Identifiers: *Active research projects, Research

Active research projects of the Research and Development Unit of the New York State Department of Environmental Conservation are ment of Environmental Conservation are described. These projects are titled: (1) Can dadarago Lake Eutrophication Study, (2) Effec-tiveness of Lagoons as a Tertiary Treatment tiveness of Lagoons as a Tertiary Treatment Device, (3) Evaluation of a Plastic Media Trickling Filter, (4) Fate of Applied Nutrients in Streams, (5) Land Disposal of Wastewater, (6) Nitrogen Removal by Chlorination, (7) Occurrence and Transport of Nutrients and Hazardous Polluting Substances, (8) Reduction of the Eutrophication of Lower St. Regis Lake by Point Source Phosphorus Removal, and (9) West Coxsackie Project. Lists are included of research personnel and planned future publications. Also given is the current status of 33 reports of the Department concerning environmental quality. Research needs listed are studies of: (1) urban, suburban, recrea-tional and agricultural land runoff water quality; (2) eutrophication of lakes; (3) the development of an economical and workable individual home waste treatment unit; (4) operation of existing wastewater treatment plants; (5) movement of phosphours through soils, (6) means of improving the efficiency and reliability of wastewater treatment processes; (7) sludge disposal technology; (8) nitrogen removal from wastewater; (9) infiltration into sanitary and combined sewers; (10) disposal of toxic materials removed from wastewaters (12) economical means to prevent pollution from combined sewer overflows. (Poertner) W74-12234

COASTAL - ESTUARINE AND NEARSHORE PROCESSES, AN ANNOTATED BIBLIOG-RAPHY.

Ocean Engineering Informaton Service, La Jolla, Calif.

For primary bibliographic entry see Field 2L.

10D. Specialized Information **Center Services**

TOXIC MATERIALS INFORMATION CENTER, Oak Ridge National Lab., Tenn. Environmental Information Systems Office E. D. Copenhaver, G. U. Ulrikson, L. S. Corrill, B.

K. Wilkinson, and L. T. Newman. In: ORNL-NSF-EATC-6, p 393-406, January 1974. 1 fig, 6 tab, 11 ref.

Descriptors: *Toxicity, *Toxins, *Information exchange, *Information retrieval, Documentation, Publications, Data collections, Bibliographies, Cadmium, Arsenic, Environment. Identifiers: *Toxic Materials Information Center.

The Toxic Materials Information Center (TMIC) of the Environmental Information System Office collects, stores, and disseminates pertinent information on materials in the environment, with particular emphasis on toxic elements and or-ganometallic compounds. Originally established as a project support center for the EATC Program, TMIC continues to fill this need along with a broader role of information retrieval and dissemination for the whole NSF/RANN Environ-mental Aspects of Trace Contaminants Program. During the reporting period, TMIC has created data bases pertinent to trace contaminants research; provided information retrieval and acquisition of nonlocal documents and papers; acquisition of nonlocal documents and papers; maintained a program library and distribution lists for the EATC Program; and has published special annotated bibliographies on cadmium and arsenic, four issues of NSF/RANN Trace Contaminants Abstracts, and NSF/RANN Trace Contaminants Program Directory. TMIC has also participated in the preparation of state-of-the-art reviews and has completed a preliminary study on the feasibility of extracting environmental data in a tabular format. (See also W74-12021) (Houser-ORNL) W74-12035

EFFLUENT MANAGEMENT INFORMATION SYSTEM (EMIS), Development Sciences, Inc., East Sandwich,

Mass For primary bibliographic entry see Field 5G.

W74-12082

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION

Group 10D—Specialized Information Center Services

A Q-METHODOLOGICAL STUDY OF AT-TITUDES TOWARD WATER RESOURCES AND IMPLICATIONS FOR USING MASS MEDIA IN DISSEMINATION OF WATER RESEARCH RESULTS, Missouri Univ., Columbia, Water Resources

Research Center

For primary bibliographic entry see Field 6B. W74-12192

METHODS FOR TRANSFERRING WATER RESOURCES RESEARCH FINDINGS TO PRAC-TICING ENGINEERS, North Carolina Univ., Chapel Hill. Dept. of En-

vironmental Sciences and Engineering J. C. Lamb, III.

J. C. Lamb, III.
Available from the National Technical Informa-tion Service, Springfield, Va 22161 as PB-236 046, \$3.75 in paper copy, \$2.25 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Completion Report, (UNC-WRRI-74-96), Report No 96, June 1974, 48 p, 2 fig, 15 tab. OWRT A-066-NC(1). 14-31-0001-3833.

Descriptors: *Information *Information retrieval, *Research, *North Carolina, *Education, *Training, Engineering edu-

Identifiers: *Technology transfer, Information transfer, Information dissemination, Continuing education.

Origins of communications problems between researchers and those who should use their findings in solving real-world problems are reviewed. Existing systems for continuing educareviewed. Existing systems for continuing educa-tion of water resources professionals are seriously deficient in resolving these problems. A survey identified those areas of water resources knowledge of greatest interest to practicing professionals in North Carolina. Over 500 responses indicating serious interest in enhancing professional knowledge in this field. The questionnaire assayed demand for educational materials in 44 specific topics, views on delivery methods, and biographical data for the respondents. Available techniques for information transfer were surveyed and evaluated for potential application under con-ditions prevalant in North Carolina. At this time special printed materials, taped lectures and slides special printed materials, taped lectures and slides represent the most practical tools, considering personnel available for their preparation and facilities to which most participants would have access. More complex materials, such as movies, taped television lectures and computer assisted instruction, should be developed but would have minor application immediately because of limitations in personnel and physical facilities. Pilot modules based on taped lectures, slides and written materials were represent and tested with representations. als were prepared and tested with representative groups of practicing professionals and found to be an effective method of transferring research findings to water resources engineers and other practitioners, if assembled into modules interesting and relevant to their problems and needs. (McJunkin-North Carolina State) W74-12363

THE DEVELOPMENT AND OPERATION OF A PROTOTYPE STATE ENVIRONMENTAL INFORMATION CENTER,

East Central State College, Ada, Okla. Environ-mental Information and Media Center.

R. V. Garner.

Final Conference Report for the National Conference on Managing the Environment, Environmental Protection Agency, Washington, D.C., p. VI:32-VI:34, 1974.

Descriptors: *Libraries, *Information exchange, *Information retrieval, *Education, Data collections, Data transmission, Local governments, State governments, Budgeting, Costs, Computers, Films, Documentation, Research facilities. Identifiers: Oklahoma Environmental Information and Media Center(OEIMC)

The Oklahoma Environmental Information and Media Center (OEIMC) was established by the Oklahoma legislature to meet the pressing need for comprehensive environmental data. Two broad categories were established: (1) short range, i.e., problem solving, enforcement and training, includes environmental management information for small industry, enforcement information for local and state agencies, training materials, and infor-mation necessary for research activities, and material solicited by the public; and (2) long range, i.e., education, continuing research and public in-formation, encompasses information for curricuformation, encompasses information for curricu-lum building, for special interest groups, and for governmental and industrial planning activities. Acquisition of documents, microfiche, abstract listings, films, periodicals, newsletters, journals, and a referral list of environmental expertise began. OEIMC performs a variety of services: (1) problem requests for easily retrievable informa-tion, (2) educational displays, (3) a field service for local government and small industry facilitating use of the center's resources, (4) publication of a periodical, and (5) media presentations. Cost fac-tors currently necessitate manual information tors currently necessitate manual information searches, but an increasing number of requests obviates the use of automation. One such automated system employing a hard wire associative logic, using limited software, easily accessed by keyboard, and accommodating remote terminals is now on loan to OEIMC and will soon be purchased. (See also W74-12457) (LaPointe-North Carolina) W74-12473

10F. Preparation Of Reviews

THE EFFECTS OF ENVIRONMENTAL STRESS ON OUTBREAKS OF INFECTIOUS DISEASE

OF FISHES,
Eastern Fish Disease Lab. Bureau of Sport Fisheries and Wildlife, Kearneysville, W. Va. For primary bibliographic entry see Field 05C. W74-12249

COASTAL MARINE POLLUTION AND FISH, Fisheries Research Board of Canada, West Van-couver, B.C. Pacific Environmental Inst. For primary bibliographic entry see Field 05C. W74-12252

RESEARCH NEEDS IN WATER QUALITY CRITERIA, 1972.

National Academy of Sciences-National Academy of Engineering, Washington, D.C. Environmental Studies Board For primary bibliographic entry see Field 05G. W74-12675

2 Experimental Evaluation of Chemical Trans- port in Water-Saturated Porous Media: 1. Non-	ACCUMULATION Effects of the Polychlorinated Biphenyl Arochlor 1254 on the American Oyster Cras-	Authorizing and Providing for Construction of a Water Distribution System and a Water Supply for the Soboba Indian Reservation.
sorbing Media,	sostrea Virginica,	W74-12612 6E
W74-12306 2G	W74-12259 5C	Corps of Engineers Dredge and Fill Jurisdic-
2-4-5-T The Toxicity of 2,3,7,8-Tetrachlorodibenzo-P-	ACETYLCHOLINESTERASE Anticholinesterase Action in Methyl Parathion,	tion: Buttressing a Citadel Under Siege, W74-12620 5G
Dioxin (TCDD) in Guppies (Poecilia Reticu-	Parathion and Azinphosmethyl in Mice and	A DAMPAGED A STATE A CENTORIO
latus Peters),	Fish: Onset and Recovery of Inhibition,	ADMINISTRATIVE AGENCIES State Governments Tackle Pollution,
W74-12274 5C	W74-12273 5C	W74-12465 6G
ABATEMENT	ACETYLCHOLINESTERASE ACTIVITY	Water Bank ActReport.
Ecology and Analysis of Trace Contaminants -	The Susceptibility of Selected Insecticides and	W74-12610 6E
Progress Report, January 1973-September 1973.	Acetylcholinesterase Activity in a Laboratory Colony of Midge Larvae, Chironomus Tentans	
W74-12021 5B	(Diptera:Chironimidae).	Yuma Irrigation ProjectNotice of Operation and Maintenance Charges.
Recovery of Toxic Metals from Industrial Ef-	W74-12276 5C	W74-12614 3F
fluent Solutions by Solvent Extraction,	ACIDS	ADMINISTRATIVE REGULATION
W74-12033 5D	Argillization by Descending Acid at Steamboat	Baker Lake Watershed Project, Fallon County,
Electrochemical Recovery of Reducible Inor-	Springs, Nevada,	Montana (Final Environmental Impact State-
ganic Pollutants from Aqueous Streams,	W74-12651 2K	ment).
W74-12034 5D	ACTIVATED CARBON	W74-12601 4A
ABKHAZ ASSR (GANTIADI)	Activated Carbon and Other Techniques for	ADMINISTRATIVE REGULATIONS
Potential of Geophysical Methods for Studying	Color Removal from Kraft Mill Effluents, W74-12423 5D	Controlling Activities of Coastal Wetlands. W74-12603 6E
Fresh-Water Discharges in the Coastal Zones of Seas.	W/+12425	W /4-12003
W74-12329 2L	ACTIVATED SLIME	Yuma Irrigation ProjectNotice of Operation
	Treatment of Wastewater, W74-12445 5D	and Maintenance Charges. W74-12614 3F
ABSOLUTE LIABILITY	W/4-12445	W/4-12014 3F
High Seas Oil Port Act. W74-12615 6E	ACTIVATED SLUDGE	Deepwater Ports.
W/4-12015	Metabolism of Components of Extended Aera- tion Activated Sludge,	W74-12619 6E
ABSORPTION	W74-12001 5D	Corps of Engineers Dredge and Fill Jurisdic-
Accumulation of Strontium-90 in Young Carp,		tion: Buttressing a Citadel Under Siege,
W74-12042 5B	Nitrogen Removal and Phosphorus Precipita-	W74-12620 5G
Food Chains in Fresh Water,	tion in a Compartmentalized Aeration Tank, W74-12243 5D	Sowashee Creek Watershed, Lauderdale Coun-
W74-12050 5C	System of Combined and Profound Treatment	ty, Mississippi (Final Environmental Impact Statement).
Levels of Cobalt, Cesium and Zinc in Some	of Pulp and Paper Industry Waste Waters with	W74-12626 4A
Marine Organisms in Japan,	Activated Sludge,	ADSORPTION
W74-12244 5C	W74-12428 5D	Food Chains in Fresh Water,
Acute Toxicity and Accumulation of PCB (KC	Electrolytic Flotation,	W74-12050 5C
300) in Freshwater Fish, (In Japanese),	W74-12439 5D	Adsorption of Phosphate by River Particulate
W74-12245 5C	ACTIVATION ANALYSIS	Matter,
The Absorption of Low Concentrations of	Determination of Zinc and Nickel by Charged	W74-12288 5B
Sulphur Dioxide into Aqueous Solutions,	Particle Activation Analysis,	Determination of Dispersion and Nonlinear Ad-
W74-12311 5B	W74-12484 5A	sorption Parameters for Flow in Porous Media,
On the Absorption of SO2 in Ocean Water,	ACTIVE RESEARCH PROJECTS	W74-12299 2G
W74-12320 2K	Active Projects, Pure Waters Research.	Sorption of Orthophosphate on the Surface of
	W74-12234 10C	Water Sample Containers,
Comparison of Cadmium 115M Retention in	ADDITIVES	W74-12307 5A
Rats Following Different Routes of Administra- tion,	Effects of Raw Materials and Chemical Addi-	Losses of Trace Concentrations of Cadmium
W74-12505 5B	tives on Mill Effluent Losses, W74-12416 5D	from Aqueous Solution During Storage in Glass
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W74-12518 5C	Biodegradability of the Paper-Mill Wastes, in Relation to the Biocides Used.	Clay Water InteractionsAn Experimental
. DOODDWOON CONTROLLED	W74-12419 5C	Study of Interface Phenomena, W74-12654 2G
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The Solubility of Very Low Concentrations of Carbon Monoxide in Aqueous Solution,	The Role of the Chemicals Used in Paper and	AERATION
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	W74-12427 5G	W74-12001 5D
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diana,	Management for the Future,	Nitrogen Removal and Phosphorus Precipita- tion in a Compartmentalized Aeration Tank,
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Roads in the Subarctic,	The Positive Role of Environmental Manage- ment.	Effects of Aeration in Earthen Ponds on Water Quality and Production of White Catfish,
W74-12223 5G	W74-12464 6G	W74-12251 5C

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W74-12428	5D	W74-12500 5A	Continuous Culture of Filomentous Blue Const
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W74-12456	5D	Air Pollution from Fuel Combustion in Sta- tionary Sources.	pendix D, W74-12591 5C
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		Great Lakes,	W74-12161 2I
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in Kyushu, Japan (In Japanese),	29 June 1972).	the Determination of Uranium in Natural
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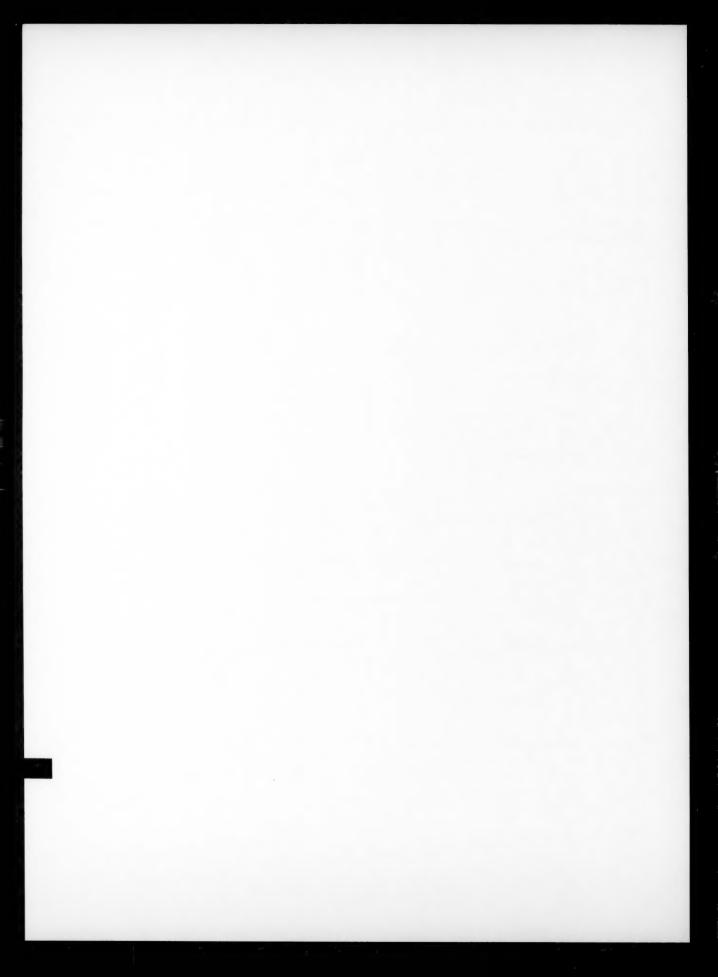
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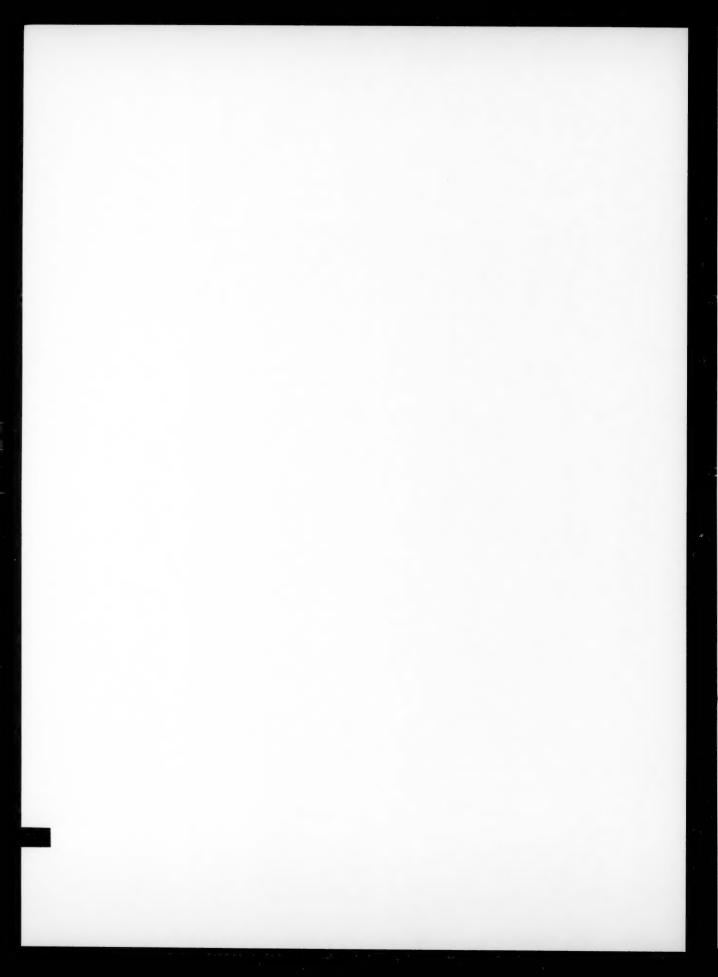
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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